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McDONALD (W. J. B.). **The utilization of benzol in the Tobacco industry.**—*J. Dep. Agric. Vict.*, xxxv, 4, pp. 157–160, 3 figs., 1937.

Replies to a recent questionnaire as to the efficacy of the benzol vapour treatment of tobacco seed-beds against downy mildew or blue mould [*Peronospora tabacina*: *R.A.M.*, xvi, p. 284] show that the consensus of opinion among growers in Victoria is favourable to this method of control, which was employed during the 1936–7 season over some 5,000 sq. yds., at an average cost of 1*s.* 5½*d.* per sq. yd., with generally satisfactory results. In districts where the disease is prevalent early plantings (second to third week of October) mostly withstood infection better than the later ones. Blue mould losses tend to be more severe on light sandy soils than on the heavier types of land. The Dungowan variety has latterly proved more resistant to the disease than Hickory Pryor.

CICCARONE (A.). **Una virosi del Pomodoro. (Nota preliminare.)** [A virus disease of Tomato. (Preliminary note.)]—*Riv. Pat. veg.*, xxvii, 3–4, pp. 73–77, 1 fig., 1937.

In April, 1936, Perfection tomatoes grown at Palermo from English seed developed symptoms of fern leaf [*R.A.M.*, xvi, p. 639]. The young leaves were much dwarfed (in some cases being only a thin border round the midrib), contorted, thickened, brittle, and sometimes deeply laciniated. Most of the flowers dropped before they opened, and those that remained attached were malformed and gave malformed fruits. New shoots were put out and the fern-leaf symptoms gradually disappeared, the plants showing by the end of May mosaic symptoms similar to those on other tomato varieties in the vicinity. No fruits were set, and the plants finally wilted. As tomatoes grown from the same seed in other localities were reported to have been similarly affected, the author considers that fern leaf may be seed-borne.

NEWTON (W.) & EDWARDS (H. I.). **Virus studies. III. Tomato diseases.**—*Canad. J. Res.*, xv, Sect. C 4, pp. 162–167, 1937.

A survey in 1936 of the commercial glasshouses of Vancouver Island and the lower Fraser Valley in British Columbia showed that tomatoes grown in them are attacked by single virus streak, mixed virus streak, yellow or aucuba mosaic (tobacco virus 6) [*R.A.M.*, xiv, p. 261; xvi, p. 66], and potato streak virus X [ibid., xvi, p. 285], of which the first-

named is by far the most common disease. There appeared to be several strains of this virus, three forms producing symptoms characterized by leaf distortion (fern leaf) [see preceding abstract], necrosis and mottle, and mottle only, respectively. It was shown that this virus is serologically distinct from tobacco viruses 1 and 6, although there was an indication of a distant relationship with the former. While streak X occurred less frequently in the glasshouses than single virus streak, it was found to be economically important, since in many houses less than half the plants yielded marketable fruit, owing to this disease. No case of tomato mosaic (tobacco virus 1) was found during the survey, although the virus is quite common on tobacco in British Columbia. Aucuba mosaic was determined in only one case. Mixed virus streak (due to single virus streak+potato virus X) occurred twice in the glasshouses in 1936 and though quite pathogenic is comparatively rare. It caused local lesions on *Nicotiana glutinosa* followed by a mottle, and is thereby readily distinguishable from single virus streak.

KORDES (H.). **Die Anfälligkeit der einzelnen Tomatensorten Bacterium michiganense entgegen und Versuche zur Verhütung der Weiterverbreitung dieses Erregers.** [Susceptibility of individual Tomato varieties to *Bacterium michiganense*, and experiments on the control of the further spread of this pathogen.]—*Gartenbauwiss.*, xi, 2, pp. 231–236, 3 figs., 1937.

After stating that the great majority of the more important commercial varieties of the tomato in Germany have been shown both experimentally and by field observations to be more or less susceptible to *Bacterium* [*Aplanobacter*] *michiganense* [*R.A.M.*, xvi, p. 628], the author expresses the view, based on his own experience, that most of the field spread of the organism is caused by the pruning or pinching off of the side shoots. A confirmation of this view was obtained in experiments, in which this spread was prevented by the careful disinfection of the pruning knife in formalin before passing from one tomato plant to the next, but in practice this procedure proved uneconomical, and consequently was not adopted by the growers. With the object of removing this drawback, in 1933 the author tried breaking off the shoots at as early a stage of development as feasible instead of pruning them out, and by this means he claims to have been successful in preventing the spread of the disease without undue injury to the plants; the method is now being increasingly adopted by tomato growers in the Palatinate.

BUHR (H.). **Pflanzengallen Mecklenburgs. III.** [Plant galls of Mecklenburg. III.]—*Arch. Ver. Naturg. Mecklenb.*, N.F., x (*1935*), pp. 35–51, 1936. [Received June, 1937.]

Among the fungal and bacterial plant galls of Mecklenburg enumerated in this annotated list may be mentioned *Taphrina aurea* [*R.A.M.*, xvi, p. 563] and *T. johansonii* [ibid., vi, p. 177] on poplars, *T. ulmi* on elms [ibid., viii, p. 630; xv, p. 745], *T.* spp. on a number of fruit and forest trees, *Microstroma juglandis* forming small, vesicular outgrowths on young walnut (*Juglans regia*) leaves [ibid., xv, p. 74], and *Protomyces macrosporus* [ibid., xii, p. 73] on carrots.

Schwerdtfeger (F.). **Die wichtigeren forstpathologischen Arbeiten des Jahres 1936. Kritische Übersicht.** [The outstanding investigations on forest pathology in the year 1936. A critical survey.]—*Forstarchiv*, xiii, 8, pp. 133–142, 1937.

This is a list, supplemented by brief critical observations, of the principal investigations on forest pathology in Germany in 1936 [cf. *R.A.M.*, xv, p. 615]. Most of the papers cited deal with entomological researches; those relating to fungal diseases of trees have been noticed in this *Review*.

Fron (G.). **La maladie de l'Orme.** [The Elm disease.]—*Rev. Eaux For.*, lxxv, 3, pp. 193–200, 4 pl., 1937.

The writer's report on the favourable preliminary results of his experiments in the control of the elm disease (*Ceratostomella ulmi*) in France by means of cryptonol or sunoxol has already been noticed from another source [*R.A.M.*, xvi, p. 350].

Westerdijk (Johanna). **Die Notwendigkeit der Anfälligkeitsprüfungen unserer Laub- und Nadelhölzer.** [The necessity of susceptibility tests of our broad-leaved and coniferous trees.]—*Angew. Bot.*, xix, 2, pp. 119–126, 1937.

The author cites some striking examples of fungal epidemics affecting soft and hardwoods in Holland, in which connexion the importance of extensive varietal reaction tests, comprising inoculations under widely differing environmental conditions, in the development of resistant types is emphasized.

Went (Johanna C.). **Verslag van de onderzoekingen betreffende de Iepenziekte, verricht in het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn gedurende 1936.** [Report on the Elm disease investigations conducted in the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1936.]—*Tijdschr. PlZiekt.*, xliii, 4, pp. 75–90, 1937.

Further studies were carried out in Holland in 1936 on the varietal susceptibility of selected elm seedlings to *Ceratostomella ulmi* [*R.A.M.*, xv, p. 615 and next abstracts]. Positive results were obtained in a considerable proportion of the inoculation tests on *Ulmus foliacea* from France, Spain, Rumania, and Greece, and on *U. glabra* and its var. *fastigiata* from England and Baarn (Holland), respectively. The resistant selection No. 24 of *U. foliacea* was again tested with very satisfactory results, while Nos. 28, 31, 42, and 44, and *U. glabra* No. 49 also showed promise of utility for grafting purposes. In inoculation tests on *U. americana*, *C. ulmi* was found to grow more rapidly above than below the site of infection. In *U. glabra* the development of the fungus was observed to proceed more quickly during the hot weather in early July than at the end of May.

Walter (J. M.). **Variation in mass isolates and monoconidium progenies of Ceratostomella ulmi.**—*J. agric. Res.*, liv, 7, pp. 509–523, 6 figs., 1937.

A detailed and illustrated account is given of cultural studies of mass

and monoconidial isolates of *Ceratostomella ulmi*, on lines similar to those followed by Swingle [*R.A.M.*, xvi, p. 142]. The results of the two works lead the author to the conclusion that *C. ulmi* comprises a wide range of cultural races [ibid., xvi, p. 504], some of which are highly variable, though the presence within the species of relatively stable lines is not precluded; he is further inclined to the opinion that sector variants, which appeared in isolates from diseased elm trees and in monoconidial progenies from these isolates, are true mutants. It is believed that conclusive evidence has been obtained that the strikingly different cultural races of *C. ulmi* arise fortuitously and that they are being produced in nature, a fact of considerable importance to those concerned in the cultural diagnosis of cases of Dutch elm disease.

BEATTIE (R. K.). **The Dutch Elm disease in Europe.**—*Amer. Forests*, xliii, 4, pp. 159–161, 201, 6 figs., 1937.

Elms attacked by *Ceratostomella ulmi* [see preceding abstract] are stated to have been first observed almost simultaneously in 1919 in Holland (Tilburg and Hoeven, near Oudenbosch), France (between Châlons-sur-Marne and Ste. Menehould), and Belgium, where the disease, however, probably dates back as early as 1913, judging by counts of infected annual rings in a log recently cut between Rochefort and Dinant. Dying elms are common along the railway from Calais to Paris, and for miles along the roads east of the city the old trees have almost disappeared. The disease was detected in the summer of 1936 near Vichy, whence some burl elm logs have been imported into the United States; other countries exporting these burls or galls (commercially known as 'Carpathian elms' but thought to be possibly due to crown gall [*Bacterium tumefaciens*: *R.A.M.*, x, p. 765]) are England, Czecho-Slovakia, and Germany. *C. ulmi* has been reported to cause heavy damage in Italy [ibid., xvi, p. 353], 90 per cent. of the trees in one locality of Emilia being reported dead, 52 to 78 per cent. in five others, and 33 to 45 per cent. in nine more of the same province. In 1936 *C. ulmi* was isolated from brown streaks in the 1923 annual ring of elms near Newmarket, although the occurrence of the disease in England was first recorded at Totteridge, near London, in 1927. Infection has spread northward to Felton (Northumberland), within 30 miles of the Scottish border, to the east coast, and to the Lake District. Recovery from the disease does not confer immunity, nor does it prevent the infected individual from acting as a reservoir of contamination.

RANKIN (W. H.). **Summary of the Dutch Elm disease eradication project.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1936*, pp. 14–21, [1937].

In reviewing the results obtained up to August, 1936, in the Dutch elm disease [*Ceratostomella ulmi*: see preceding abstract] eradication campaign in New York, the author states that no diseased elms have been found farther than 50 miles from New York City in any direction. On 22nd August, 1936, there were 1,496 diseased elms in New York State, as compared with 2,258 and 2,503 in 1935 and 1933–4, respectively. In the entire infected area east of the Hudson river the corresponding figures for 1933–4, 1935, and 1936 (up to 31st August) were 2,361, 1,680, and 1,101, while in the city itself the corresponding figures

were 1,257, 690, and 249. In Manhattan, Queens, and Brooklyn only 10 diseased elms were found in 1936 (up to 31st August), as against 138 in 1934.

The results obtained in New York City have conclusively shown that the eradication campaign has reduced the number of infections to a point where local (as against Federal) control has become practicable. It is expected that the annual loss of elms in the city will be reduced to under 100 next year or the year after, and that the scattered infections found 30 to 50 miles distant from the city will be erased annually. The author concludes that the disease can be confined to the present limited zone and that the large area to the north and east of New York can thus be protected.

McKenzie (M. A.) & Becker (W. B.). **The Dutch Elm disease. A new threat to the Elm.**—*Bull. Mass. agric. Exp. Sta.* 343, 16 pp., 8 figs., 1937.

A concise account is given in popular terms of the symptoms and manner of spread of Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstract], to assist in the immediate recognition of the disorder should it make its appearance in Massachusetts. It has already been found within fifty miles of the State boundaries to the south and west.

Creager (D. B.). **Cephalosporium wilt of Elms.**—*Proc. nat. [U.S.] Shade Tree Conf., 1936*, pp. 140–144, [1937].

The causal organism of the *Cephalosporium* wilt of elms in North America [*R.A.M.*, xvi, p. 504] is stated to have been named and definitely described by May and Verrall as *Dothiorella ulmi* [In *Mycologia*: see *R.A.M.*, Nov. no.]. Two types of reproductive bodies are produced, naked spore heads and pycnidia, the latter appearing singly or in stromatic groups.

Entrance into the host takes place through leaf wounds caused by insects, the fungus finally becoming established in the vessels of the young twig, and overwintering in the twig tips as vegetative mycelium and pycnidia. Pycnidia in the bark of dead branches or on the ground produce viable spores the following spring.

Preliminary tests on control indicated that all infected trees should be excluded from plantings and nurseries, the introduction of diseased stock being the chief cause of epidemics. Carefully pruning out affected branches twice or more during the year is sometimes effective. Badly diseased trees should be eradicated and burned, and all others kept as free as possible from insect injury, especially those that are already infected or in proximity to infected trees. Applications of a combined insecticidal-fungicidal spray may reduce the number of leaf infections.

Faull (J. H.). **Pathological studies on Beech at the Arnold Arboretum.**—*Proc. nat. [U.S.] Shade Tree Conf., 1936*, pp. 21–29, [1937].

After giving a brief, popular account of the beech bark disease associated with *Cryptococcus fagi* and a variety of *Nectria coccinea* [*R.A.M.*, xv, p. 542], the author states that one crop of the spores of *Fomes fomentarius* [ibid., xvi, p. 633] is discharged during a two- to four-week period between the latter part of April and the end of May. Infection

is set up in wounds, through stubs or dead branches, entry generally taking place in the crown.

ROMBOUTS (J.). **Uma molestia de 'Eucalyptus' e de 'Populus', na Bahia, causada por 'Corticium salmonicolor' B. et Bred.** [A disease of *Eucalyptus* and *Populus* in Bahia, caused by *Corticium salmonicolor* B. & Bred.]—*Rodriguésia*, ii, 7, pp. 301–305, 2 figs., 1936. [Received June, 1937.]

Corticium salmonicolor is stated to have been found for the first time in 1935–6 attacking *Eucalyptus* and *Populus nigra* trees in moist and shady places at the Experimental Station of Agua Preta, Bahia. On *Eucalyptus* it caused a rapid wilting of the leaves which remained attached to the twigs for long periods of time after death. The attacked twigs died back, and the fungus eventually reached the main stem, on which canker-like wounds were formed, edged by callus tissue; very occasionally the wounds extended to the trunk, sometimes resulting in the death of the tree. On the poplar the fungus chiefly attacked the young shoots and twigs high up the tree, the first symptom being the sudden death of the leaves; the bark of the main stems was rarely found to be infected, and no cankers were seen. The *Necator decretus* stage of the fungus was observed on *Eucalyptus* but not on the poplar.

MOUNCE (IRENE) & MACRAE (RUTH). **The behavior of paired monosporous mycelia of Fomes roseus (Alb. & Schw.) Cooke and Fomes subroseus (Weir) Overh.**—*Canad. J. Res.*, xv, 4, pp. 154–161, 1 pl., 12 figs., 1937.

The results of cultural experiments briefly described in this paper confirmed the view that *Fomes subroseus* [*R.A.M.*, xiv, p. 795] is specifically distinct from *F. roseus*, with which it had been confused for many years, inasmuch as monosporous mycelia of the two fungi did not form clamp-connexions when paired with one another in all possible combinations. The two species may also be differentiated by the characters of their spores, which are elongate ellipsoid in *F. roseus* and narrow cylindric and slightly curved in *F. subroseus*. It was further established that the two organisms are heterothallic and bipolar, and with one exception, complete interfertility was shown to exist between haploid mycelia of either one of them, independently of their source of collection. The exception is of particular interest, in that it shows that the two cultures of *F. roseus* from widely separated sources, which in the first pairing experiments failed to produce clamp-connexions, possess one interfertility factor in common.

KANZOW (H.). **Die Douglasie. Aufstellung einer Ertragstafel auf Grund der Ergebnisse der preussischen Probeflächen und Auswertung von Provenienzversuchen.** [The Douglas Fir. Compilation of a yield table on the basis of the data from the Prussian test areas and the evaluation of investigations in the place of origin.]—*Z. Forst- u. Jagdw.*, lxix, 2, pp. 65–93; 3, pp. 113–139; 5, pp. 241–271, 4 figs., 18 graphs, 2 maps, 1937.

On the basis of this exhaustive, fully documented survey of the timber output of certain Douglas fir [*Pseudotsuga taxifolia*] stands **set**

aside for experimental purposes in Prussia, the writer draws some conclusions bearing on the relation of the place of origin of the seed on the development of disease in the trees, with special reference to *Rhabdocline pseudotsugae* [*R.A.M.*, xvi, p. 507], the incidence of which is shown to have steadily increased from 1932 to 1935. In general, the disease is of economic importance only in stands from seed originating at altitudes of 1,500 m. and above, the resistance of the coastal forms amounting for practical purposes to immunity. In future, therefore, Douglas fir supplies from the United States should consist exclusively of the maritime forms, those of the continental regions being further undesirable on account of their slow growth and susceptibility to the honey fungus [*Armillaria mellea*: ibid., xi, p. 141]. Abrupt changes of climate are very liable to induce pathological manifestations in *P. taxifolia*. Thus, Schotte found (*Medd. Skogsforsöksanst. Stockh.*, p. 305, 1923) that in Sweden *Phacidium infestans* [*R.A.M.*, xiv, p. 266] occurs with great severity on conifers of southern origin transplanted to northern areas.

Wilson (M.). **The Phomopsis diseases of conifers.**—*Scot. For. J.*, li, 1, pp. 39–45, 1937.

A review is given of some recent outstanding contributions to the knowledge of *Phomopsis* diseases of conifers, notices of most of which have appeared from time to time [*R.A.M.*, xiv, p. 541 *et passim*].

Wilson (M.). **The occurrence of Keithia tsugae in Scotland.**—*Scot. For. J.*, li, 1, pp. 46–47, 1937.

Keithia tsugae was observed in January, 1937, attacking the leaves of *Tsuga canadensis* [*R.A.M.*, xv, p. 331] in the Tweed valley and causing a brown discoloration, necrosis, and defoliation. So far only one tree has been found infected and the evidence points to a recent introduction of the fungus, an active parasite, from the United States. Seen from a distance, the tree presents a patchy, brown aspect due to the development of groups of diseased twigs. The mature fructifications, consisting of a layer of asci with four bicellular, brownish ascospores, and paraphyses, are cushion-like, circular, dark brown, about $\frac{1}{4}$ in. in diameter, and occur in clusters of up to 18 or so on the under side of the leaf.

Faull (J. H.). **Chrysomyxa empetri—a Spruce-infecting rust.**—*J. Arnold Arbor.*, xviii, 2, pp. 141–148, 2 pl., 1 diag., 1937.

Full details are given of the writer's successful cross-inoculation experiments with *Chrysomyxa empetri* (hitherto known only on *Empetrum*) from *E. nigrum* in Quebec on *Picea glauca* and *P. rubens* and reciprocally from *P. glauca*, on which it was observed in the *Peridermium* stage at Metis Beach, Quebec, in 1933. The reddish-brown, aparaphysate, subepidermal spermogonia of the rust, formed on the current season's needles, measure 135 to 162 μ in breadth and 108 to 135 μ in depth and extrude subglobular to ellipsoid spermatia, 5·5 to 10 by 5 to 7 μ, in a colourless, sticky liquid. The maximum height and width of the yellow, elliptical to subcircular aecidia (peridermia), also on the current season's needles, are 0·5 to 2 and 0·5 to 1·5 mm., respectively; the polygonal cells of the colourless peridium measure 32 to 76

by 19 to 54 μ, and the yellow, ellipsoid or ovoid, rarely subspherical, verrucose aecidiospores 42 by 27 μ. The catenulate, orange, pulverulent, ellipsoid, ovoid, or subglobose uredospores measure 27 to 48 by 21 to 27 μ (average 35 by 25 μ). The yellow, cushion-shaped, subcircular to elongated teleutosori, occurring on over-wintered leaves of *E. nigrum* and other species (of which *E. atropurpureum* and *E. eamesii* are new records for Quebec and Newfoundland, respectively), produce yellow, catenulate spores, 19 to 24 by 18 to 21 μ. The pale yellow, slightly curved to strongly arched basidia measure up to 65 by 7 to 8 μ and the very thin-walled, subglobose to slightly ellipsoid basidiospores 10 to 15 (usually 12) μ in diameter.

GILGUT (C. J.). **Cytospora canker of Spruces.**—*Proc. nat.* [*U.S.*$_{\text{f}}$] *Shade Tree Conf., 1936*, pp. 113–119, [1937].

The die-back of the lower limbs of blue spruce [*Picea pungens* var. *glauca*] and Koster's spruce (*P. pungens* [var.] *kosteri*), associated in North America with a *Cytospora* [*R.A.M.*, xii, p. 408] since identified by L. E. Wehmeyer as *C. kunzei*, starts on the limbs nearest the ground, and spreads upwards and laterally. It is commonest on trees over 15 years old, and occurs both on small branches and large limbs, trunk infection being observed in Canada. The visible effect is most striking in winter, when the brown, dead leaves on the limbs girdled in summer appear in strong contrast to the silvery-green leaves on the healthy limbs. Below the recently killed limbs those dead for over one season are leafless. Cankers are generally found on branches and limbs $\frac{3}{4}$ in. in diameter or more. The cankered area is usually near the trunk, but may be on any portion of the main limb or a side branch; infection generally starts on the under side of a limb, and is usually accompanied by gum exudation. There is no external evidence of canker other than the death of the limb or the presence of gum.

Inoculations on healthy, wounded limbs of Norway spruce [*P. excelsa*] with a spore suspension or mycelium gave positive results while unwounded similarly inoculated limbs and controls remained healthy. It is concluded that *C. kunzei* is a virulent wound parasite.

KOLLMANN (F.). **Technologie des Holzes.** [The technology of wood.]—xviii+764 pp., 170 figs., 159 diags., 275 graphs, Berlin, J. Springer, 1936. RM. 69. [Received June, 1937.]

This exhaustive, fully documented treatise on the technology of wood contains sections on bacterial and fungal decay and their prevention by chemical impregnation and other methods, reference to which has been made from time to time in this *Review*.

HENDRICKX (F. L.). **Les champignons pigmentogènes du bois.** [Wood-staining fungi.]—*Ann. Gembl.*, xliii, 4, pp. 97–113, 1937.

Short notes are given on a large number of staining fungi belonging to the Ophiostomataceae, Aspergillaceae, Lasiosphaeriaceae, Helotiaceae, Sphaeropsideae, Dematiaceae, Stilbaceae, Tuberculariaceae, and other Fungi Imperfecti, followed by sections on their ecology (i.e., requirements in point of nutrition, aeration, temperature, and humidity),

the effects of the staining on the properties of the wood and pulp, and control [*R.A.M.*, xvi, p. 579]. A bibliography of 60 titles is appended.

ROBAK (C. A.). **Way discovered to protect wooden poles with arsenic trioxide.**—*Industr. Engng Chem.*, News Ed., xv, 8, p. 171, 1937.

A Swedish patent recently taken out by the Boliden mining company describes a simple method of applying arsenic trioxide or preparations based on this compound to wooden telegraph poles, fence posts, and the like. The substance is moulded into cylinders of appropriate size, which are inserted into axial holes bored into the ends of the poles, those in the lower ends being closed by a wooden plug and those in the upper ends by a piece of galvanized iron plate with a central hole of 1 to 2 mm. in diameter. Transportation of the arsenic compound from the cylinders into the surrounding wood is effected by rain water or water absorbed from the soil.

RIGG (T.), ASKEW (H. O.), & CHITTENDEN (E.). **Brown-heart of Swedes and Turnips in Nelson district: a boron deficiency ailment.**—*N.Z.J. Sci. Tech.*, xviii, 10, pp. 750–755, 2 figs., 1937.

A survey of the swede and turnip crops in the Nelson district of New Zealand revealed a wide prevalence of brown heart [*R.A.M.*, xvi, p. 360], the incidence of which in certain cases amounted to 100 per cent. On a local soil associated with a serious boron deficiency disease of apples [ibid., xvi, p. 388], the application of 56 lb. borax per acre as a top-dressing to young Imperial Green Globe turnips largely controlled brown heart. Chemical analyses of healthy swede and turnip crops showed them to contain up to 18·8 p.p. m. boron in the dry matter compared with a minimum of 4·7 p.p. m. for the diseased plants.

ROLAND (G.) & DECOUX (L.). **Recherches sur les carences de magnesium et de phosphore chez la Betterave sucrière.** [Studies on magnesium and phosphorus deficiencies in the Sugar Beet.]—*Publ. Inst. belge Amélior Better.*, v, 2, pp. 43–72, 7 figs., 1937. [Flemish, German, and English summaries.]

Sugar beets grown in nutrient solutions or on sand deprived of magnesium develop interveinal chlorosis of the outer and middle leaves, the affected tissues of which rapidly become covered with fungi, especially *Alternaria* sp. [*R.A.M.*, xv, p. 765]. The sugar content of the diseased foliage was found to be higher than that of healthy leaves. The affected seedlings die in about two months. Soil samples from Belgian fields in which the beets showed symptoms resembling the foregoing in 1936 were found to be poor in magnesium, and the analysis of material from plots forming part of a potash-manuring experiment showed that the application of heavy potash dressings tends to deplete the available magnesium.

Beets grown in nutrient solutions without phosphorus may live for a considerable time but remain stunted. The foliage is dark green, the outer leaves developing a blackish-brown necrosis starting at the tip of the lamina and progressing downwards without any preceding chlorotic symptoms.

[An account of this work is also given by G. Roland in *C.R. Congr. int.*

Indus. agric., *1937*, pp. 457–467, 1937, and in *Tijdschr. PlZiekt.*, xlii, 8, pp. 171–188, 1937.]

Bennett (C. W.). **Correlation between movement of the curly top virus and translocation of food in Tobacco and Sugar Beet.**—*J. agric. Res.*, liv, 7, pp. 479–502, 5 figs., 1 graph, 1937.

Continuing his studies on the curly top virus in sugar beet and tobacco [*R.A.M.*, xvi, p. 226], the author gives a detailed account of experiments, the results of which showed that beet seedlings were probably almost entirely invaded by the virus in two to four days, whereas in larger plants the virus in some cases took over four weeks to pass from a mature inoculated leaf to a similar uninoculated leaf on the opposite side. In Turkish tobacco the virus was found to move more rapidly in the direction of the root system than in the reverse direction. In *Nicotiana glauca* plants 3 ft. high, the virus moved downwards from infected Turkish tobacco grafts at the top to healthy grafts at the base in average periods of 28 and 32 days, but in plants on which the position of the infected and healthy grafts was reversed, the virus required averages of 130 and 302 days to reach the top and produce symptoms in the healthy grafts. In some of these plants the tops were not reached by the virus in over a year, but when they were defoliated at the top the apical grafts developed symptoms in an average period of 18 days from defoliation. When one shoot of a beet plant with three shoots was inoculated with curly top, and a second was defoliated or placed in the dark for five days without inoculation, the third shoot serving as control, curly top symptoms developed in the defoliated or darkened shoot in average periods of 10·6 to 17·6 days, i.e., from 0·1 to 5·6 days later than in the inoculated shoot, while the control shoot remained free from symptoms for periods of 55 to 183 days on the average; other tests in which leaf hoppers (*Eutettix tenellus*) were used to detect the virus indicated that the virus moved from inoculated shoots showing symptoms into uninoculated shoots that were both darkened and defoliated in 24 to 48 hours. It was further shown that the virus moved out of inoculated green beet leaves in the light in four hours, but failed in most instances to move out of etiolated leaves, inoculated at their distal end, and kept in the dark in periods as long as 21 days; the virus, however, moved out of the inoculated etiolated leaves in 24 to 72 hours when the leaves were returned to light five days after inoculation.

These results are considered to indicate that the movement of the virus in the hosts bears little or no relation to virus multiplication or to virus concentration gradients, but is dependent on physiological processes inside the normal plant. Apparently in both beet and tobacco invasion of some parts may be prevented by providing conditions favouring the synthesis of excess carbohydrates, and, on the other hand, may be induced by providing for food deficit in these parts, strongly suggesting a correlation between virus movement and food translocation.

Johnson (F.) & Jones (L. K.). **Two mosaic diseases of Peas in Washington.**—*J. agric. Res.*, liv, 8, pp. 629–638, 5 figs., 1937.

The results of the authors' investigations during the last two years

of mosaic of peas in western Washington [*R.A.M.*, xv, p. 345] showed the existence there of two distinct virus diseases of the crop, namely, enation mosaic [ibid., xvi, p. 583], which is apparently similar to the one referred to as common pea mosaic by Zaumeyer and Wade [ibid., xvi, p. 83], but differing from it in that it systemically infects Corbett Refugee beans; and 'severe' mosaic, apparently similar to Zaumeyer and Wade's white sweet clover mosaic [loc. cit.]. These two virus diseases often develop destructively in Washington, especially on market-garden and canning peas in the western part of the State. A tabulated account is given of special tests, the results of which again showed that the two viruses are very seldom carried by the seed, and that severe mosaic has a wide range of hosts among leguminous plants, while that of enation mosaic is much more limited. It was further found that the enation virus was inactivated in less than three hours *in vitro* and in less than four days in dry plant tissue; it does not resist dilution, possibly because of its very rapid inactivation in extracted plant juice, and no infection could be obtained with enation virus exposed to temperatures from 40° to 50° C. The severe mosaic virus, on the other hand, remained active *in vitro* for at least 15 days and in dry plant tissue for 338 days; it still retained a low percentage of infectivity at 1 in 100,000 dilution, but was not infective at 1 in 1,000,000 dilution, and was inactivated at temperatures between 60° and 70° C.

Berger (G.). **Un grave maladie de la Fève au Maroc (Botrytis fabae Sard.).** [A serious disease of Broad Bean in Morocco (*Botrytis fabae* Sard.).]—*Rev. Path. vég.*, xxiv, 2, pp. 101–111, 4 figs., 1937.

Broad beans [*Vicia faba*] in Morocco have for some years been seriously attacked by *Botrytis fabae* [*R.A.M.*, xvi, p. 230] Though difficult to distinguish morphologically from *B. cinerea*, *B. fabae* is distinctly different from *B. cinerea* in its biological characters and specificity to *V. faba*, inoculations of this host with conidia of *B. fabae* and of the strains of *B. cinerea* from geranium and banana giving positive results only in the case of the first-named organism. The disease was reported from Chaouia, Doukkala, Tadla, and the northern districts of Morocco. It is at present one of the most virulent parasites of broad beans locally, especially under damp conditions. All dead, infected leaves should be burnt, at or before the completion of harvesting, rotation should be practised, due allowance being made for the fact that the spores are wind-borne, and, finally, spraying with a strongly adhesive copper mixture might be tried as a preventive measure.

McKay (R.). **Germination of oospores of Onion mildew, Peronospora schleideniana W. G. Sm.**—*Nature, Lond.*, cxxxix, 3522, pp. 758–759, 1 fig., 1937.

The addition of 0·01 to 0·02 per cent. potassium permanganate to water containing 5- to 6-year-old oospores of onion downy mildew (*Peronospora schleideniana*) [*R.A.M.*, xvi, p. 627], weathered out-of-doors, resulted in 60 to 85 per cent. germination within 48 hours at 15° to 20° C., compared with 0·05 to 1 per cent. in the controls. The reagent did not appear to act directly on the oospores, the presence of plenty of organic remains being essential for germination, which

ordinarily takes place by means of a main hypha with three to nine short branches arising at irregular intervals from it.

EVANS (R. I.). **Cytological studies on the parasitic relationship of Urocystis cepulae to Allium fistulosum.**—*Amer. J. Bot.*, xxiv, 4, pp. 214–218, 17 figs., 1937.

In this study on the nature of the host-parasite relations between *Urocystis cepulae* [*R.A.M.*, xii, pp. 416, 610] and *Allium fistulosum*, it was found that seedlings that ultimately produce smut-free plants are consistently and successfully parasitized by the fungus in the upper parts of the cotyledons, where chlamydospores are freely produced, though the lower half at least remains unaffected. The prevalence and severity of infection was little affected by a range of soil temperatures extending from 10° to —26° C. Healthy mycelium was able to develop in the upper part of a cotyledon with profuse chlamydospore formation.

When penetration of the lower part of the cotyledon occurs the invading hypha with its branches may be completely inhibited almost immediately, or some of the branches may be inhibited, this being quickly followed by the disorganization of those branches which had penetrated rather more deeply into the host tissue, or, again, the fungus may penetrate the deeper tissues where, however, the environment becomes unsuitable for its further growth.

This defence mechanism is apparently comparable with that of *A. cepa* seedlings when passing from susceptibility to resistance.

SCHUPHAN (W.). **Untersuchungen über wichtige Qualitätsfehler des Knollenselleries bei gleichzeitiger Berücksichtigung der Veränderung wertgebender Stoffgruppen durch die Düngung.** [Studies on important defects of quality in Celeriac, together with a consideration of the change induced by manuring in groups of desirable substances.]—*Bodenk. u. PflErnähr.*, N.F., ii, 5–6, pp. 255–304, 3 col. pl., 7 figs., 2 graphs, 1937.

In the course of this exhaustive investigation of certain defects involving a serious depreciation in the market value of German celeriac, the writer discusses a discoloration of the sliced rootstocks known as 'iron- or rust-spot', which was formerly attributed to iron oxidation but has now been traced, by intensive anatomical and microchemical analyses on the Delikatess variety, to the accumulation in special 'excretion vessels' of resinous substances and ethereal oils.

Blackening of the rootstocks on cooking has been found to result from a disturbance of the metabolic and physiological equilibrium through the simultaneous lack of calcium and nitrogen in the soil.

Hollowness, due to the rupture of cells in the pith, appears to be primarily a varietal peculiarity, e.g., of Saxa and less conspicuously of Delikatess.

WASEWITZ (H.). **Die Salatfäule und ihre Bekämpfung.** [Lettuce rot and its control.]—*Kranke Pflanze*, xiv, 4, pp. 71–73, 1937.

The following methods have given good control of lettuce rot (*Sclerotinia minor*) at the plant protection headquarters, Giessen (Germany) [*R.A.M.*, xv, p. 420]. The seed-beds may be treated, 10 to 14

days before the planting-out of the crop, with 10 l. per sq. m. of a 2 to 3 per cent. formaldehyde solution, 0·25 per cent. uspulun, or brassikol, the last-named a stimulatory dust to be strewn over the surface at the rate of 40 to 50 gm. per sq. m. Sterilization may also be effected by steaming either by means of grids fitted with a vapour-generating apparatus operating at a temperature of 100° to 110° C. for not less than 20 minutes, sunk into the soil to a depth of 40 to 50 cm., or by heating the soil in a hermetically sealed container of ½ cu. m. capacity at 100° for 20 minutes. The former method is more suitable for large-scale use and the latter for small gardens. The cost of steaming to a depth of 50 cm. may be reckoned at approximately Pf. 55 to 60 per sq. m. and that of chemical treatment at Pf. 15 to 55.

Röder (K.). **Perithecien von Erysiphe cichoracearum DC. em. Salm. an Freilandgurken (Cucumis sativus L.).** [Perithecia of *Erysiphe cichoracearum* DC. em. Salm. on outdoor Cucumbers (*Cucumis sativus* L.).]—*Angew. Bot.*, xix, 2, pp. 161–163, 1 fig., 1937.

Attention is drawn to the occurrence in 1935 on outdoor cucumbers near Berlin of the perithecial stage of *Erysiphe cichoracearum* [*R.A.M.*, xvi, p. 365], the detection of which is stated to be the sole reliable means of differentiating this mildew from the similar disease caused by *Sphaerotheca* [*humuli* var.] *fuliginea* [loc. cit.].

Panse (E.). **Die Kräuselkrankheit (Rosette, Mosaik) bei Erdnüssen.** [Curl disease (rosette, mosaic) of Groundnuts.]—*Tropenpflanzer*, xl, 5, pp. 218–220, 1937.

According to an article in *Bull. mens. Ag. econ. A.O.F.*, 190, 1936, groundnut rosette is widespread in Senegal, having first been observed at Bambey in 1924, again in 1929, occurring in epidemic form in 1930, sporadically in 1931, and entirely disappearing until 1935, when the yield from late planted fields (first half of July) was nil in the Bas-Saloum region (near British Gambia) [*R.A.M.*, xii, p. 5]. A circular of the Acting Governor of French West Africa states that the losses from rosette amount to 75 to 80 per cent. and prohibits the use for propagation of incompletely ripened nuts from infected areas; spraying with an emulsion of 425 gm. soap, 1 l. petroleum, and 50 l. water is recommended.

Broekhuizen (S.). **Mycologische vondsten op Champignonbedden.** [Mycological finds on Mushroom beds.]—*Fungus, Wageningen*, viii, 4, pp. 46–49, 2 figs., 1937.

Semi-popular notes are given on the following fungi detected in mushroom [*Psalliota* spp.] beds in Holland: *Coprinus* spp. [*R.A.M.*, xiv, p. 345; xv, p. 628], including *C. congregatus*, *C. ephemerus*, and *C. fimetarius*, *Mycogone perniciosa* [ibid., xvi, p. 15], *Myriococcum praecox* [ibid., xiv, p. 345] (the reputed connexion between which and *Papulaspora byssina* [loc. cit.] could not be traced by the writer), *Oospora fimicola* [ibid., xiv, p. 345], *Panaeolus fimicola* and *P. papilionaceus*, *Penicillium* spp., *Peziza vesiculosa*, *Pleurotus mutilus* [ibid., xvi, p. 16], *Trichoderma koningi* [cf. loc. cit.; xvi, p. 558], and *Volvaria gloiocephala*.

Müller (K.). **Ein Vierteljahrhundert Bekämpfung der Reben-Peronospora (Plasmopara viticola).** [A quarter of a century's control of the Vine *Peronospora* (*Plasmopara viticola*).]—*Angew. Bot.*, xix, 2, pp. 110–118, 1937.

The writer briefly outlines the development of his 'incubation calendar' method of forecasting attacks of vine downy mildew (*Plasmopara viticola*) to facilitate the prompt application of control measures, and compares it with the analogous systems employed for the same purpose in France [*R.A.M.*, xvi, p. 513]. French criticisms of the incubation calendar are discussed and considered to rest on a misinterpretation of the principles involved, and on failure to recognize certain fundamental differences between laboratory experiments and practical field work, for which due allowance must be made. Such inevitable minor discrepancies do not invalidate the general well-attested reliability of the system.

Rous (L.). **Essais contre le court-noué.** [Experiments on the control of court-noué.]—*Progr. agric. vitic.*, cvii, 12, pp. 285–287, 1937.

In this account of unsuccessful attempts that were made by the author to control court-noué [*R.A.M.*, xvi, p. 436] in a severely diseased vineyard of his, it is stated that a plot of White Ugni vine grafted on the French 333 hybrid on court-noué diseased soil remained free from the disease three years after planting, possibly indicating the immunity of this vine from court-noué.

Gallès (P.). **L'Ugni blanc et le court-noué.** [White Ugni and court-noué.]—*Progr. agric. vitic.*, cvii, 15, pp. 346–347, 1937.

A few observations are reported, supporting Rous's record of the marked resistance of the White Ugni vine (also known in some localities under the name St. Emilion) to court-noué [see preceding abstract], either on its own roots or grafted on various French hybrids. The author briefly describes the good points of this variety for wine production, which, if its resistance to the disease is further proved, should ensure for it a very wide extension in regions where court-noué is prevalent.

Vivet (E.). **La maladie du Cot de Chéragas.** [The 'Cot de Chéragas' disease.]—*Progr. agric. vitic.*, cvii, 15, pp. 348–349, 1937.

The author reproduces the description given by him in 1923 of a die-back of vine twigs, most frequent on the 'Cot de Chéragas' variety, which is stated to be prevalent in certain regions of Algeria. The disease usually occurs during prolonged rainy spells at the end of April or beginning of May, in the form of a black discoloration of an apical node; the discoloration works downwards, entailing a soft rot of the internodes, but does not reach the base of the shoot, stopping just before reaching a node, from which new growth is produced. The rotted portions of the shoots drop off, and the affected stocks most commonly recover on the onset of dry weather. The disease has also been observed on the Aramon and Mourvèdre varieties. The causal organism is stated to be a species of *Sclerotinia* which, like *S. libertiana* [*S. sclerotiorum*: *R.A.M.*, xiii, p. 746] forms a thick white mycelial felt and black sclerotia.

JENKINS (A[NNA] E.). **Comparações culturaes e inoculações em Videira com os fungus 'Elsinoe fawcetti', 'E. ampelina', e 'E. veneta'** [Comparative cultural studies and inoculations into the Vine of the fungi '*Elsinoe fawcetti*', '*E. ampelina*', and '*E. veneta*'.]—*Arch. Inst. biol. Def. agric. anim., S. Paulo*, vii, pp. 23–32, 3 pl. [1 col.], 9 figs., 1936. [English summary. Received June, 1937.]

The author states that in 1925, when she first studied the taxonomic status of *Sphaceloma fawcettii* (*Elsinoe fawcetti*) [*R.A.M.*, iv, p. 476, and above, p. 603], comparative cultural studies of this fungus and of *S. ampelinum* and *Plectodiscella veneta*, now classified as *E. ampelina* [ibid., xv, p. 427] and *E. veneta* [ibid., xv, p. 467], respectively, showed that the last-named differed in its pulvinate type of growth from the convolute type exhibited by the other two, which also differed from one another in certain other details. The development of the conidial fructification, which is described in some detail for *E. fawcetti*, is very similar in the three organisms. Artificial inoculation experiments in 1927, [some details of which are indicated], showed that *E. ampelina* alone was pathogenic to the vine.

BRANAS (J.) & BERNON (G.). **Résumé des recherches entreprises en 1936 sur le traitement de la panachure de la Vigne.** [A résumé of the researches undertaken in 1936 on the control of Vine variegation.] —*Ann. Éc. Agric. Montpellier*, N.S., xxiv, 3, pp. 249–252, 1937.

The partial yellowing of vine leaves known as 'panachure' or variegation [*R.A.M.*, xvi, p. 18] is stated to be transmissible from the stock to the graft in a few months. Under natural conditions the disease may disappear for no apparent reason. The author considers that the improvement in the condition brought about by spraying the foliage with lamp black [loc. cit.] is probably mainly due to the deposit screening the leaves from the sun.

BRUNDZA (K.). **Report of the Phytopathological Section of the Plant Protection Station in Lithuania for the year 1935.**—32 pp., 5 figs., Kaunas, 1937. [Lithuanian, with English summary.]

The following are among the items of interest in this report on Lithuanian plant diseases in 1935. Four fungi were observed on different organs of their hosts from those habitually attacked, viz., *Septoria lycopersici* on tomato fruits [*R.A.M.*, xv, p. 62], *Ascochyta boltshauseri* on kidney bean (*Phaseolus vulgaris*) pods [ibid., xiv, p. 613], and *Cladosporium cucumerinum* and *Colletotrichum lagenarium* on cucumber leaves and fruits, respectively [ibid., xv, pp. 197, 698]. Diseases newly recorded included *Pseudomonas vesicatoria* [*Bacterium vesicatorium*] on tomatoes [ibid., xvi, p. 493], *Phyllosticta phaseolina* on beans [ibid., xv, p. 776], *Bacillus tracheiphilus* [*Erwinia tracheiphila*] on cucumbers [ibid., xv, p. 197], *Pseudomonas* [*Bact.*] *phaseoli* var. *sojense* on soy-bean [ibid., xiii, pp. 210, 564], *Pestalozzia lupini* [*Ceratophorum setosum*: ibid., xvi, p. 636] on lupin, *Entyloma fuscum* on poppies (*Papaver*) [ibid., xvi, p. 493], *Phomopsis mali* [ibid., xvi, p. 299] on the apple, *Phoma solanicola* on potato stems [ibid., x, p. 293], and *Colletotrichum atramentarium* [ibid., xv, pp. 445, 690; xvi, p. 402] on eggplant fruits.

Zoospore and conidial suspensions of *Phytophthora infestans* were

found to retain their infective capacity towards potatoes after 24 hours' exposure to a temperature of —6° C. and to fluctuating outdoor temperatures (minimum —12°) from 4th to 18th March. The fungus caused heavy damage (up to 100 per cent.) on tomato fruits [ibid., xv, p. 62] in the damp autumn of 1935, but did not attack the foliage.

Bean seeds infected by *C. lindemuthianum* [ibid., xiv, pp. 670, 734] and *A. boltsha* [*A. fabae*] yielded poor, infected crops; good control was secured by 30 minutes' immersion in 0·25 per cent. uspulun or 10 per cent. denatured alcohol.

Mitra (M.). **India: new plant diseases recorded in 1936.**—*Int. Bull. Pl. Prot.*, xi, 5, pp. 85–87, 1937.

Among these records for 1936, a number of which have been noticed from other sources, may be cited *Fusarium moniliforme* [*Gibberella moniliformis*] reported from Calcutta as causing storage rot of citrus, and *Bacillus* [*Bacterium*] *solanacearum* [*R.A.M.*, x, p. 224] on tobacco in the Punjab.

Report of the Agricultural Department, Dominica, 1936.—Trinidad, Imper. Coll. Trop. Agric., 32 pp., 1937.

The following items of phytopathological interest occur on pp. 10–11 of this report. In view of the general incidence of Panama disease (*Fusarium* [*oxysporum*] *cubense*) of bananas throughout Dominica various recommendations for control made by C. W. Wardlaw after a visit in May were carried out in their entirety. These [which are detailed in an appendix, p. 27] included a survey of the heavily infected areas, the enforcement of quarantine measures to prohibit the removal of infected material, routine inspections and treatment, the destruction of diseased stools, and improved cultural methods. Gros Michel bananas were attacked by *Bacterium solanacearum* in several localities [*R.A.M.*, xiii, p. 684].

Thompson (A.). **Division of Mycology. Annual Report for 1936.**—*Bull. Dep. Agric. S.S. & F.M.S.*, 26, Gen. Ser., pp. 49–57, 1937.

In this report [cf. *R.A.M.*, xv, p. 632] it is stated that *Fomes noxius* [ibid., xvi, p. 635] is dangerous to oil palms only when the trees are unable from other causes to make vigorous growth. In one block of backward trees, whenever the early presence of the fungus in the outer stem tissue or adjacent leaf-base tissue was observed, advanced root rot eventually developed. The leaf bases of trees where decay did not spread to the stem later showed the presence of *F. lamaensis* [ibid., xv, p. 632], and on two trees where the stem was slightly penetrated at first they bore *F. lamaensis* var. *secedens* which appears to be morphologically and parasitically intermediate between *F. lamaensis* and *F. noxius*. In many cases it is practically impossible in the early stages to distinguish between incipient stem rot and harmless leaf-base decay.

Ustulina zonata was found on decayed leaf bases of oil palm. A few cases were noted where it attacked the underground stem tissue by way of the roots, causing 'charcoal base rot' [ibid., xv, p. 647].

Poria ravenalae [ibid., xv, p. 78] was present on coco-nut stems showing decayed patches on one side below the crown.

Yellow and white bacteria, *Penicillium* sp., *Thielaviopsis* sp., yeasts, and *Marasmius palmivorus* [ibid., xiv, p. 357] were isolated from pine-apple fruitlet brown rot, the bacteria being the organisms most commonly found. The disease, which is prevalent in Singapore, Johore, and Selangor, is invisible until the fruits are skinned, and though it affects 24 to 60 per cent. of the fruits, the damage is so slight that under 1 per cent. have to be discarded. Pineapples are also affected by broken core, fruit collapse, chlorosis [ibid., x, p. 473], and heart rot. In the first, the core is broken across, generally towards the stalk end, where a cavity develops. Ripening proceeds from the crown downwards. Fruit collapse affects apparently firm and healthy fruits, which while ripening, suddenly soften and collapse in 24 hours, emitting a frothy liquid when squeezed. Chlorosis occurred on plants growing on peaty, acid soil. A few instances of heart rot with symptoms resembling those of *Phytophthora* heart rot [ibid., xv, p. 378] occurred in Johore, but no mycelium was detected in the affected tissue.

Tea in the Cameron Highlands was affected by a condition resembling *Armillaria mellea* [ibid., xvi, p. 564] root disease.

Liberian coffee was killed by *Ganoderma pseudoferreum* [ibid., vi, p. 514]. The leaves and flowers of *Crotalaria usaramoensis* and *C. anagyroides* showed a rust due, apparently, to an undescribed species of *Uromyces* which caused serious damage without killing the plants.

[Dwyer (R. E. P.).] **Report of the Economic Botanist. Year ended 30th June, 1936.**—*New Guinea agric. Gaz.*, iii, 1, pp. 11–18, 1937.

Chlorotic diseases of coco-nuts associated with soil deficiency and favouring infection by *Thielaviopsis* [*Ceratostomella paradoxa*: *R.A.M.*, xv, p. 136], *Pestalozzia palmarum* [ibid., xvi, p. 529], and other weak parasites, are very important in New Guinea, especially on old plantations. *Marasmius palmivorus* [see preceding abstract] was found in numerous localities on the stems of coco-nuts killed by lightning-strike [ibid., xii, p. 506].

An obscure condition of coco-nut known as 'head droop' is particularly prevalent in New Ireland. The top bends over in a complete semicircle and the leaves form a rosette, the lower leaves being few, short, and in a dying-back condition. Frequently, the entire stem may form a loop or become S-shaped. Production finally ceases, and the spathes die back completely. Many palms recover and show the condition on further occasions.

Coffee thread blight (*Corticium koleroga*) [ibid., xvi, p. 314] was somewhat severe in the native areas on the Keranat demonstration plantation. In the principal coffee areas of New Guinea root rots are the most formidable diseases, the coffee having been planted in new clearings before the stumps and roots had completely decayed. Among the fungi found were *Rosellinia pepo* and *Ganoderma subrugosum* (Pat. & Boisd.).

Forty-ninth Annual Report of the Kentucky Agricultural Experiment Station for the year 1936. Part I.—63 pp., 1937.

In 1936 two new stalk diseases of tobacco were recorded in Kentucky, one being a stalk rot of dark tobacco due to a species of *Rhizoctonia* closely resembling *R.* [*Corticium*] *solani*, and the other a phloem

necrosis of the stalk of nearly mature Burley tobacco possibly due to *Bacillus* [*Erwinia*] *aroideae* [*R.A.M.*, xvi, p. 637].

The second generation of a cross between the mosaic-resistant Ambalema tobacco [ibid., xiv, p. 401] and the highly susceptible White Burley gave a few White Burley plants apparently as resistant to various strains of mosaic as Ambalema. In a study of the inheritance of mosaic resistance and the sensitivity factor of Ambalema and its hybrids about 600 F_2 plants of Burley 16×Ambalema, the former susceptible and non-sensitive, and the latter resistant and sensitive, were inoculated in the field with the white mosaic strain, and resistant plants appeared in the ratio of 1 : 12·6, suggesting two pairs of factors for resistance.

For the fourth year in succession there was little evidence that the mosaic virus in the dead roots of tobacco plants was an important source of infection [ibid., xiv, p. 685; xvi, p. 500]. Among 800 plants growing in soil in which infected tobacco had grown the summer before, only one developed mosaic of a strain used the previous year. When the stalks and leaves from the diseased plants of the previous year were cured, ground up, and added to land shortly before setting, the addition of stalks and leaves showing mosaic burn increased the percentage of mosaic in the crop from 0 and 1·2 to 37·1 and 8·5, respectively, the corresponding figures for yellow mosaic being 2·0 and 0·8 to 12·5 and 13·0, respectively.

In 84 fields of dark tobacco where the growers chewed or smoked home-cured tobacco while handling the plants the average infection just before cutting amounted to 39·9 per cent., whereas in 29 fields where home-cured tobacco was not so used the figure was only 1·8 per cent. Experimental evidence indicated that cured leaf to be used by growers for chewing or smoking should be heated to 110° C. for 5 hours to inactivate completely the infectious agent. Disinfection of the workers' hands by dipping four times in a concentrated solution of trisodium phosphate, followed by light rinsing, reduced the transmission of mosaic in one experiment from 90 per cent. to nil. It is recommended that the workers should dip their hands into this chemical occasionally while pulling or weeding.

Hybridization between White Burley varieties susceptible to *Fusarium* wilt [*F. oxysporum* var. *nicotianae*: ibid., xv, p. 614] produced two moderately resistant and good quality varieties.

The toxin produced in broth cultures of *Bacterium tabacum* [ibid., xvi, p. 566] was soluble in glacial acetic acid but not in ether, chloroform, xylene, benzene, carbon tetrachloride, or ethyl alcohol. Preliminary inoculations of tobacco with different isolants of *Bact. angulatum* [loc. cit.] and *Bact. tabacum* indicated that there are strains of each varying in pathogenicity.

Clover varieties in an experimental field were killed off by *Sclerotium bataticola* [*Macrophomina phaseoli*: ibid., xiii, p. 14].

Osmun (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1936* (*Bull.* 339), pp. 25–32, 1937.

This report [cf. *R.A.M.*, xv, p. 484] contains among others the following items of interest.

In investigations into the control of greenhouse vegetable diseases E. F. Guba found that burning sulphur at the rate of 4 lb. per 10,000 cu. ft. as a between-crop treatment completely killed all fungal spores. *Cladosporium fulvum* [ibid., xvi, p. 571] is stated to be a not uncommon cause of asthma among greenhouse workers [see below, p. 676].

In vegetable seed treatments against damping-off conducted by C. J. Gilgut and E. F. Guba, red copper oxide [see below, p. 715] gave the best results with lettuce, pepper [*Capsicum annuum*], carrot, eggplant, tomato, squash, and beet, zinc oxide with radish, turnip, cucumber, parsnip, spinach, and lima bean [*Phaseolus lunatus*], semesan with beans, onion, peas, cabbage, and cauliflower, and either semesan or semesan jr. with maize. Hot water treatment of eggplant seed at 120° to 125° F. for 30 mins. was effective against *Verticillium* [*albo-atrum*: ibid., xiv, p. 684] but the fungus is too prevalent in soils for the treatment to be of value.

Powdery mildew of greenhouse cucumbers [*Erysiphe cichoracearum*: see above, p. 653] was controlled by spray applications every 10 days of Bordeaux mixture 1–1–50, corona copper carbonate 50 per cent. at 1–50 and 18 per cent. at 2–50 and 3–50, mike-sulfur 2–50, potassium sulphide 1–50, and other sprays, ½ pint of penetrol [ibid., xv, p. 195] being added per 50 galls. of each. None of the treatments caused objectionable staining.

In two field tests on the control of *Alternaria dianthi* [ibid., xiv, p. 684] carnations were given 10 and 13 applications, respectively, of Bordeaux mixture 5–5–50, calcium arsenate 1 lb., and penetrol ½ pint, with the result that in the former the sprayed and unsprayed plants showed 96 and 1,630 infected stems, respectively, and in the latter 51 and 2,556, respectively.

W. L. Doran found that seedlings of herbaceous ornamentals made better growth in sand and sphagnum or sand and peat moss than in sand alone [ibid., xv, p. 547, and below, p. 677], but showed more damping-off, which was, however, practically negligible as compared with the amount present in soil. If soil is used for growing the seedlings it should be disinfected with formaldehyde dust or acetic acid dust. The same worker ascertained that the time of taking cuttings of woody plants affected their rooting as much as any other factor, including the presence or absence of soil fungi. Fairly hard cuttings of several species lived and struck root as well in sand or sand and peat moss inoculated with species of *Pythium* or *Rhizoctonia* as in the absence of the fungi. Cuttings taken earlier or when softer were more susceptible to infection, but when taken too late struck root less well.

A severe disease of the above-ground parts of several varieties of *Thymus serpyllum* was caused by *R.* [*Corticium*] *solani*. Infection was prevalent in rainy weather during early summer.

Silayan (H. S.). **Annual Report of the Director of Plant Industry, Commonwealth of the Philippines, for the fiscal year ending December 31, 1936.**—178 pp., 18 pl., 2 graphs, 1937.

In the section of this report [cf. *R.A.M.*, xv, p. 79] dealing with plant pathology (pp. 119–127) the following items, *inter alia*, are quoted.

Sclerotia of *Sclerotium oryzae* [*Leptosphaeria salvinii*: ibid., xvi, p. 405] were killed by immersion in mercuric chloride solution (1 in 1,000 for 2½ mins.).

In field trials under wet and dry seasonal conditions the Virginia Jumbo and Tai-tan varieties of groundnut consistently showed strong resistance to *Sclerotium* wilt [*S. rolfsii*: ibid., xv, p. 325] and high yield, whereas the Valencia and Georgia Red varieties were susceptible. Rainy weather greatly favoured the progress of infection.

Tomato leaf mould (*Cladosporium fulvum*) [see preceding abstract] was first recorded from the Philippine Islands in 1934, in Bagnio, Mountain Province. It causes more damage in the glasshouse than in the field, and may appear at any time of the year, becoming most serious in cold, damp weather.

In the selection of garden beans [*Phaseolus vulgaris*] for disease resistance the promising pole varieties Chinese Wax and Blackbean were resistant to leaf spot [? *Cercospora lussoniensis* = *C. cruenta*: ibid., iv, p. 76; xvi, p. 585], anthracnose [*Colletotrichum lindemuthianum*] and rust [*Uromyces appendiculatus*], while Genuine Cornfield was very susceptible to anthracnose, but apparently resistant to leaf spot. Of the dwarf varieties, Canadian Wonder, Longfellow, Prolific Black Wax, and a native white-seeded bean (Lepanto) were resistant to anthracnose and rust, but susceptible to leaf spot.

Definite control of cacao black pod (*Phytophthora palmivora*) [ibid., xv, p. 705] resulted from spraying with Bordeaux mixture and soap before the buds appeared, as soon as they were set, and then once every three weeks until the first harvest.

In attempts to cultivate *Volvaria esculenta* [ibid., xv, p. 422] and other edible mushrooms the best germination was given by spawn 90 to over 100 days old; the largest crops were given when rice straw with abacá [*Musa textilis*] trimmings or rice straw alone was used, and the beds were covered with galvanized iron sheets to conserve moisture and afford protection against the effects of heavy rains.

Magrou (J.) & Lominski (I.). **Propriétés humorales non spécifiques de certains tissus végétaux.** [Non-specific humoral properties of certain plant tissues.]—*C.R. Soc. Biol., Paris*, cxxv, 16, pp. 224–227, 1937.

Details are given of agglutination experiments on *Pelargonium*, the results of which clearly demonstrated that these plants are endowed with non-specific humoral properties differing with the presence or absence of tumours caused by *Bacterium tumefaciens* [*R.A.M.*, xvi, p. 590]. The juices of tumour-bearing stems are haemo-agglutinating, anticomplementary, and precipitate guinea-pig and white of egg serum at considerably higher dilutions than do those of the tumours themselves or of healthy plants. Thus, crown gall infection, which is expressed locally by tumour production, involves a general modification of the plant constitution discernible by serological methods.

Straib (W.). **Die Untersuchungsergebnisse zur Frage der biologischen Spezialisierung des Gelbrostes (Puccinia glumarum) und ihre Bedeutung für die Pflanzenzüchtung.** [The results of studies on the

problem of biologic specialization in the yellow rust (*Puccinia glumarum*) and its importance in plant breeding.]—*Züchter*, ix, 5, pp. 118–129, 1937.

This is a tabulated review of the results of recent studies in Germany and elsewhere on biological specialization in the yellow rust of wheat (*Puccinia glumarum*) [*R.A.M.*, xvi, pp. 372, 524], with special reference to its bearing on the work of breeding for resistance to the disease. From a consideration of the problem as a whole there would appear to be every prospect of the successful development of satisfactory commercial rust-resistant selections of wheat and barley. There are no special genetic complications in the combination of rust resistance with other desirable characters, and the inoculation of appropriate crosses with the chief biological races of the rust is a simple and reliable method of eliminating susceptible material.

Laumont (P.). **Observations sur la récolte des céréales en Algérie (campagne 1935–1936).** [Observations on the cereal yield in Algeria (season 1935–1936).]—*Bull. Soc. Agric. Algérie*, lxxix, 496, pp. 132–152, 1936. [Received April, 1937.]

Exceptionally severe damage was caused in Algeria in 1936 by *Puccinia graminis*, especially in the Chéliff plain and the Mascara district, where the wheat crop was a practically total failure. Extreme susceptibility to the disease was shown by the late maturing varieties, Hedba 3, Langlois 1527, and Tlemcen 277 and 294, the only resistant commercial sort being Oued Zenati 368. All the new early wheats of Indian or Australian extraction proved very susceptible to *P. glumarum*.

Ophiobolus graminis contributed locally to the severe yield reductions of 1935–6 and is likely to spread with the extension of the susceptible Baroota, Florence-Aurora, and certain Pusa varieties.

In connexion with the alarming increase of loose smut of wheat (*Ustilago tritici*) in Tunis (from 1 to 1·5 per cent. in 1934 to 25 per cent. in 1936 according to the author's unpublished data) and Algeria, directions are given for the control of the disease by the hot water treatment [*R.A.M.*, xvi, p. 444].

Friedrichson (G. A.). Ржавчина Пшеницы в условиях орошаемого Заволжья. [Wheat rusts in the irrigated districts of the Trans-Volga region.]—*Pl. Prot., Leningr.*, *1937*, 12, pp. 35–50, 1937.

The results of investigations, started in 1934, showed that winter and spring wheats in the semi-arid districts to the east and south-east from Saratoff, on the left banks of the Volga, suffer most from brown and black rusts (*Puccinia triticina* and *P. graminis*); yellow rust (*P. glumarum*) though present, is of no economic significance. Spring-sown wheats were shown to become infected with brown rust from winter wheats, on which the rust overwinters in the uredo stage, and the closer the former crops were to the latter the greater was the percentage of rust infection. The problem of the spring infection of the wheats with black rust remains unsolved, since it was not observed to overwinter in the region on the winter crops, barberry is practically non-existent, and in 1935 uredospores of *P. graminis* were only detected in the air 12 days

after the appearance of black rust pustules on the wheats, excluding the possibility of the introduction of infection by air from other regions. Special tests showed that irrigation of the fields before sowing did not increase the severity of the rusts, but repeated irrigation tended to increase the susceptibility of the susceptible varieties, especially when effected at periods most favourable for the growth of the hosts, i.e. seven days after the beginning of tillering, and seven days after the beginning of ear formation. In slightly susceptible varieties, however, such as Hordeiforme 432, Melanopus 69, and the hybrid 432×62, repeated irrigation did not increase the percentage of rust infection. Early sown spring wheats appeared to suffer less from rust than later sowings. Experiments with fertilizers showed that susceptibility was increased by nitrogen; phosphorus alone did not affect susceptibility to the same degree as nitrogen, but in combination with it acted as nitrogen alone. A well-balanced fertilization with combined nitrogen, phosphorus, and potassium gave the lowest incidence and intensity of the rusts.

Vaviloff (N. I.). Новые достижения по борьбе с ржавчиной за границей. [New achievements in rust control abroad.]—*Pl. Prot., Leningr., 1937*, 12, pp. 5–10, 1937.

The author gives a summarized account of trials in the U.S.S.R. of a number of United States and Canadian new wheats resistant to rust [*Puccinia* spp.], most of which have not yet been concluded. The greatest promise of adaptability to Russian conditions is apparently offered among the spring wheats by Thatcher [*R.A.M.*, xvi, p. 589], a Minnesota cross between the Kanred×Marquis and Marquis×Iumillo hybrids; by the Canadian varieties Apex and Renown which are resistant to stem [black] rust [*P. graminis*], and the relatively older Canadian Kitchener, Marquis, and Garnet wheats; among the winter forms, the most promising results have so far been obtained with the Kansas wheats Illini Chief, Fulhard, and the Kanred×Marquis 214211 hybrid.

Sukhorukoff (K. T.) & Ovčarov [Ovtcharoff] (K. E.). **On the nature of immunity to rust.**—*C.R. Acad. Sci. U.R.S.S.*, N.S. (*1937*), xiv, 6, pp. 393–396, 1937.

With reference to the recent paper of Gretschushnikoff [*R.A.M.*, xv, p. 710], who found urea and high concentrations of ammonia in various plants infected with rusts [*Puccinia* spp.] and interpreted these substances as toxins elaborated by the parasites, the authors give a tabulated account of biochemical tests, the results of which showed that in the leaves of healthy, 20-day-old wheat plants grown in the greenhouse at normal light intensity, the amount of ammonia decreased progressively from 35·5 mgm. per 100 gm. fresh weight in the highly rust-resistant *Triticum timopheevi* to 24·5 mgm. in the susceptible *T. vulgare* var. *lutescens* No. 062, the two intermediate species tested, *T. monococcum* and *T. durum* var. *hordeiforme*, yielding 32·0 and 28·0 mgm., respectively. Further tests showed that keeping the wheat plants in darkness, which was shown by Gassner [ibid., vii, p. 82] to prolong the development of rusts, considerably increased the amount of ammonia contained in the leaves (from 14 to 25·9 mgm. per 100 gm. fresh leaves

after 10 days in *T. durum* var. *hordeiforme*, and from 6 to 54·9 mgm. in *T. vulgare* var. *lutescens* No. 062). Urea was also found in leaves of *T. timopheevi* (15·2 mg.) and wheat (21·0 mg.). The ammonia content of a variety had no relation to the activity of its urease, though in the presence of this enzyme (which was activated by shading) urea readily passes into ammonia. From their studies the authors conclude that resistance to rusts in wheats is a direct function of their content in ammonia, which, moreover, is a hereditary character of wheat varieties, modified by environmental conditions.

Naoumova (Mme N. A.). Естественные колебания температуры и продолжительность инкубационного периода **Puccinia glumarum f. tritici (Erikss. et Henn.).** [Temperature fluctuations in nature and duration of incubation period of *Puccinia glumarum* f. *tritici* (Erikss. & Henn.).]—*Pl. Prot., Leningr., 1937*, 12, pp. 51–66, 2 graphs, 1 diag., 1937. [English summary.]

This is a full report of the author's experimental work in the greenhouse in Leningrad with wheat yellow rust (*Puccinia glumarum* f. *tritici*), a brief summary of which has already been noticed from another source [*R.A.M.*, xv, p. 784]. It was shown that the shortest incubation period (eight days) occurred with the diurnal temperatures fluctuating between 15° and 25° C., and the longest (21 days) at temperatures between 3° and 5°. The minimum temperature for infection was found to be 3°, the optimum between 5° and 11°, and the maximum 23°. The critical temperature for the appearance of the rust pustules was a night minimum of 2° and day maximum of 24° to 25°. At average diurnal temperatures of 20° the pustules ripened in one to two days, and at temperatures of 8° to 10° in from two to five days. It is considered that the correlation established between temperature and the type of infection on germinating wheat, the appearance of chlorotic spots, and the size, colour, and number of pustules on the hosts may be of importance in the differentiation of physiologic races of yellow rust, and may also be used in forecasting local renewal of the rust in the spring. On the territory of the U.S.S.R. yellow rust is stated to be most widespread in the Central Asian Republics.

Bubentzoff (S.). Методика выделения головневого гриба **Ustilago tritici (Pers.) Rostr.** из зараженных семян Пшеницы. [A method for the isolation of the smut fungus *Ustilago tritici* (Pers.) Rostr. from infected Wheat grain.]—*Pl. Prot., Leningr., 1937*, 12, pp. 89–94, 1937. [English summary.]

In order to ascertain the percentage of loose smut (*Ustilago tritici*) infection in wheat samples, before and after disinfection, the author elaborated the following method of isolation. The grain was disinfected with mercuric chloride, steeped in sterile water for 24 hours, disinfected again, broken into pieces or crushed, sown on potato glucose agar, and incubated at 25° to 27° C In one experiment this method gave 60 to 75 per cent. infected grain, as compared with 64 to 72 per cent. as determined by anatomical analysis.

Saburova (Mme P. V.). Определение заболевания Пшеницы пыльной головней по формирующемуся колосу. (Предварительное сообщение). [Determination of loose smut infection in Wheat by the developing ear. (Preliminary note).]—*Pl. Prot., Leningr., 1937*, 12, pp. 171–173, 2 figs., 1937.

This is a summarized account of experiments, the results of which showed that infection in wheat plants with loose smut [*Ustilago tritici*] may be diagnosed within a month or even less from sowing by the following abnormalities in the rudimentary ear, namely: (*a*) the absence of awns in awned varieties, (*b*) brown streaks extending over the whole length of the ear, especially conspicuous at its apical portion, and consisting of accumulations of chlamydospores, and (*c*) flattened shape of the spikelets which tend to stand away from the rachis, whereas in healthy plants the spikelets are convex in the middle and adhere firmly to the rachis.

Angell (H. R.), Hely (F. W.), & Allan (Miss F. E.). **The effect of Urocystis tritici Koern. on the extent of development of the roots and aerial parts of the Wheat plant. I.**—*J. Coun. sci. industr. Res. Aust.*, x, 2, pp. 136–142, 1937.

The results of statistical study indicated that flag smut (*Urocystis tritici*) [*R.A.M.*, xvi, p. 305] of wheat causes in the root system a reduction which is influenced by environmental conditions and is more pronounced in plants grown in the winter than in those grown in the spring. The root system of the susceptible Federation variety was less affected than that of Ford (moderately resistant) and Nabawa (resistant). In the first-named variety the weight of the tops was significantly reduced by infection, but was increased in the case of Nabawa, while there was a significant reduction for Ford in one experiment but not in another.

Raabe (A.). **Helminthosporium tritici vulgaris Nisikado Erreger einer Blattfleckenkrankheit des Weizens.** [*Helminthosporium tritici vulgaris* Nisikado, the agent of a leaf spot disease of Wheat.]—*Phytopath. Z.*, x, 1, pp. 111–112, 2 figs., 1937.

Helminthosporium [or *Drechslera*] *tritici-vulgaris* [*R.A.M.*, x, p. 233] is stated to have been responsible for extensive damage to wheat and spelt in the Tübingen district of Germany in 1935, reappearing in a milder form in 1936. This is believed to be the first record of the disease in Europe. Under local conditions the fungus forms on the leaf blades oval or lanceolate, later confluent, yellowish- to greyish-brown lesions, up to 2 cm. long and several mm. in width. The brown, transversely septate conidiophores are mostly straight, 90 to 220 by 6 to 11 (usually 9) μ, and the pale olive or almost colourless, cylindrical, obtuse-ended, 3- to 13-septate conidia measure 80 to 270 by 15 to 19 μ.

Thomas (R. C.). **The role of certain fungi in the 'sick Wheat' problem.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 185, pp. 43–45, 1937.

Isolations from the outer coat of 'sick wheat' (i.e., wheat threshed and stored with a relatively large amount of moisture present and containing only 20 to 25 per cent. viable grains) gave 13 different fungal

species and strains, including six different species of *Penicillium*, three of *Aspergillus*, one each of *Alternaria* and *Helminthosporium*, *Cephalothecium* [*Trichothecium*] *roseum*, and *Fusarium* '*roseum*'. The toxicity of the filtrates through a Chamberland-Pasteur filter from 43-day-old cultures of these fungi when tested (by soaking for 24 hours at 25° C.) against good Fulhio wheat seed (91 per cent. germination) varied widely, germination ranging from 88 per cent. for wheat treated with filtrate from cultures of *F.* '*roseum*' to only 43 and 22 per cent. for that from cultures of *Aspergillus flavus* strains 4 and 7, respectively. Filtrate from 73-day-old cultures of strain 4 was less toxic, while that of strain 7 maintained its toxicity, the effect of the filtrates being more masked in wheat germinated at 37·5° than at 8°. A spring wheat (Minn. 2223) tested against the extracts from 73-day-old cultures of both strains was more susceptible than Fulhio.

It is concluded that the fungi isolated exert a deleterious action of varying intensity on the wheat, but the association becomes significant only when the moisture content of the grain is high and the temperature favourable to mould growth.

Wada (E.) & Fukano (H.). **On the difference and discrimination of Wheat mosaics in Japan.**—*J. imp. agric. Exp. Sta.*, iii, 1, pp. 93–128, 15 pl. (2 col.), 1937. [Japanese, with English summary.]

This is an expanded account of the writers' studies on wheat mosaic in Japan, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 618]. In addition to the familiar yellow and green forms of mosaic, a composite type has been observed in which the foliar mottling is yellow or brown, affected plants become dwarfed and their appearance ultimately resembles that of stands affected by green mosaic. Besides the two kinds of X-body (A and B) already described [loc. cit.], associated with green and yellow mosaic, respectively, a third intermediate type (M) has been observed occurring in a variable ratio, together with the two foregoing, in plants suffering from the composite form. Sometimes type M resembles B but with some vacuoles, sometimes type A with badly differentiated vacuoles and rough margin. The results of varietal reaction tests showed that Haya-Komugi is susceptible to both green and yellow mosaic, Kumamoto-Komugi No. 1 to yellow but not to green, and Saikoku-Hozoroi to green but not to yellow. Of 30 soil types examined, 8 were found to be conducive to the development of green mosaic, 4 to that of yellow, and the remaining 18 to that of both forms of the disorder. Two different viruses, acting singly, are believed to be responsible for the green and yellow mosaics, while the composite type results from their joint operation.

Husemann (C.). **Grundlagen und Möglichkeiten der Ertragssteigerung und -sicherung auf sogenannten heidemoorkranken, ertragsunsicheren Sand- und Humusböden.** [Foundations and possibilities of yield increase and assurance on the so-called 'heath moor-diseased' sand and humus soils of uncertain productivity.]—*Z. Pfl-Krankh.*, xlvii, 4, pp. 211–232, 1937.

A tabulated account is given of four years' experiments (1933 to 1936, inclusive) on the influence of appropriate cultural methods and of

various fertilizers on the health and yield of crops liable to suffer from reclamation disease in a sandy moorland soil with a fluctuating humus content and fairly acid reaction in the Stade district of north Germany [*R.A.M.*, xv, p. 792].

The general condition of the crops (winter and summer rye, black oats, potatoes, lupins, and serradella [*Ornithopus sativus*]) was found to respond favourably to rational field sanitation, comprising, for instance, improvements in the physical structure and constitution of the soil, plentiful applications of synthetic fertilizers, judicious crop rotation, and timely sowing of summer cereals, quite apart from the indisputably beneficial effects of copper sulphate (50 or 100 kg. per hect.). The exact nature and extent of the amelioration induced by the last-named treatment can only be gauged by a protracted series of observations involving statistical data on the yields obtained in trial plots.

Ling (L.) & Moore (M. B.). **Influence of soil temperature and soil moisture on infection of stem smut of Rye.**—*Phytopathology*, xxvii, 5, pp. 633–636, 1937.

In a series of experiments in constant temperature tanks in the greenhouse at University Farm, St. Paul, Minnesota, in 1932 and 1934 to determine the influence of soil temperature and moisture on the incidence of *Urocystis occulta* on Dakold and Rosen rye [*R.A.M.*, xiv, p. 30], infection was prevalent at a range of 5° to 25° C., with an optimum from 13° to 17°. It is possible that the lower optima are correlated with shallow planting. High soil moisture (65 per cent. of the water-holding capacity) reduced the amount of infection and may also have restricted the temperature range of fungal activity.

Marcy (D. Elizabeth). **Inheritance of resistance to the loose and covered kernel smuts of Sorghum. II. Feterita hybrids.**—*Bull. Torrey bot. Cl.*, lxiv, 5, pp. 245–267, 2 graphs, 1937.

Continuing her studies on the genetics of the resistance of sorghum hybrids to *Sphacelotheca cruenta* and *S. sorghi* [*R.A.M.*, xvi, p. 598 and cf. next abstract], the author found from infection reactions with *S. sorghi* that when the resistant Dwarf Yellow milo variety was crossed with feterita (resistant, but producing blasted heads when the seedling environment strongly favoured infection), approximately $\frac{1}{16}$ of the F_2 plants were susceptible. This confirmed the assumption that these varieties possessed different factors for resistance. When Dwarf Yellow milo was crossed with the susceptible varieties Shallu, Dakota Amber sorgo, Dawn kafir, and Sumac sorgo, approximately $\frac{1}{4}$ of the F_2 plants were susceptible, indicating that Dwarf Yellow milo brought into the crosses a factor for resistance (R) completely epistatic to a factor for susceptibility (S) brought in by the susceptible varieties.

When feterita was crossed with the susceptible varieties, the results indicated the interaction of S and a factor for resistance brought in by feterita (B). Under conditions strongly favouring infection S was epistatic to B, segregation in the F_2 generation, as reconstructed from F_3 data, approximating to the ratio of 13 infected to 3 healthy plants. When conditions were less conducive to infection, the F_2 ratios approxi-

mated to 3 resistant plants to 1 susceptible. It was therefore concluded that hybrid plants containing both S and B were extremely unstable in their reactions to *S. sorghi*, and that the epistasis of S over B or B over S was entirely dependent on the environmental conditions prevailing during germination.

Results with *S. cruenta* indicated that when Dwarf Yellow milo was crossed with the susceptible varieties there was a two-factor interaction similar to that of feterita hybrids inoculated with *S. sorghi*. When feterita was crossed with the susceptible varieties resistance was dominant, and the interaction of three factors was indicated. No infected plants resulted from the crosses of feterita with Dwarf Yellow milo, indicating that these varieties possess at least one common factor for resistance. Possibly the factors governing reaction to *S. sorghi* may also determine the reaction to *S. cruenta*, but in a reverse sense.

RODENHISER (H. A.). **Echinulation of chlamydospores and the pathogenicity of a previously undescribed race of Sphacelotheca cruenta.**—*Phytopathology*, xxvii, 5, pp. 643–645, 1937.

Ninety monosporidial lines of the F_1 hybrid of a cross between an F_3 inbred line of *Sphacelotheca sorghi* and a similar one of *S. cruenta* [*R.A.M.*, xiv, p. 438 and preceding abstract] were back-crossed to the recessive *S. sorghi* parent, and evidence was obtained of the segregation of factors governing various constitutional characters, including chlamydospore texture. Of 85 chlamydospores of the original 90 progeny of the back-cross examined, 48 were echinulate and 37 smooth. Segregation of echinulate and smooth chlamydospores in relation to sorus type in the hybrid progeny was as follows: in 14 of the *S. sorghi* type, 9 had smooth chlamydospores and 5 echinulate, the corresponding figures for 49 *S. cruenta* type being 19 and 30, respectively, and for 22 intermediate type, 10 and 12, respectively. A collection of *S. cruenta* on Johnson grass [*Sorghum halepense*] with very prominently marked chlamydospores proved to be apparently a new physiologic race; it was highly pathogenic to the plants of a kafir×feterita (sorghum) cross in two series of inoculation tests (84·1 and 80 per cent. infection) but was innocuous to Reed kafir, Dwarf Yellow milo, and Pierce kaferita; Sudan grass [*Sorghum sudanense*] and Johnson grass contracted 17·9 and 46 per cent. infection, respectively, in the first series and 15·9 and 43·3 per cent., respectively, in the second.

CHEEMA (G. S.), KARMARKAR (D. V.), & JOSHI (B. M.). **The cold storage of Nagpur Oranges (Citrus aurantium).**—*Indian J. agric. Sci.*, vii, 1, pp. 169–175, 1937.

The authors describe investigations, carried out at Poona, on the cold storage of Santra oranges. The fruit, after 2 days in transport from Nagpur, was graded as green, turning, and yellow or fully ripe, and stored in trays at temperatures of 35°, 40°, 45°, and 52° F. in a humidity of 80 to 90 per cent. It was found that fully ripe fruit could be kept in good condition for three months at 40° without appreciable wastage; but green and turning fruits, though acquiring a good yellow colour at 45° and 52°, lost their juice during storage.

In the early part of the storage period 'dark button', a brown

discoloration of the stem-end of the fruit, was specially observed in green and turning fruits, spoiling their appearance but not damaging the pulp. In only one case was a fungus (*Diplodia* sp.) [? *D. natalensis*: *R.A.M.*, xvi, p. 601] isolated.

Internal breakdown, apparently a physiological disorder, occurred at 35° and 40°, rarely at 45° and 52°, producing a bitter taste and an odour of fermentation, the skins becoming pale brown, dull, and collapsed. Fruit thus affected, when incubated, developed only a growth of *Penicillium*, though *Diplodia* was found in one case.

Appreciable wastage, at 45° and 52°, was caused by *Alternaria* [? *citri*: loc. cit.], infection taking place through 'dark button' and spreading to the pulp, the inside of the fruit becoming nearly black.

Washing fruit with water, copper sulphate, potassium permanganate, or borax solutions, coating with zinc oxide or magnesium oxide powders or paraffin wax, and wilting at room temperature, before storage, failed to control wastage.

Frost hastened development of machines for segregating Citrus.—*Calif. Citrogr.*, xxii, 7, pp. 298–301, 2 figs., 1937.

Frost injury in January, 1937, accelerated the development of two new American machines for detecting internal defects of citrus fruit. One of these, manufactured by the Citrus Machinery Co., Riverside, is an X-ray device working on the same principle as that recently described [*R.A.M.*, xvi, p. 452]. Each machine is fitted with two X-ray tubes and screens for four operators, and each operator is enabled to examine 90 to 120 fruits per minute, discarding faulty ones by means of a foot key. It is claimed that *Alternaria* decay [*A. citri*] can be detected in addition to other defects.

The other machine, invented by H. C. Pierce of Anaheim, depends in principle on the difference in electrical resistance between sound and defective fruits, 'mushy' fruits being less, and dry fruits more resistant than sound. Metal fingers are brought into contact with each fruit as it passes through the machine, the resulting flow of current actuating segregating machinery. It is asserted that granulation, *Alternaria* and other rots, breaking down, and dryness due to freezing can be detected.

Fawcett (H. S.) & Klotz (L. J.). **A new species of Candelospora causing decay of Citrus fruits.**—*Mycologia*, xxix, 2, pp. 207–215, 6 figs., 1937.

In January, 1932, a new fungus was isolated in Florida from an orange fruit showing a firm type of decay, the rotted area being slightly sunken, with a definite margin, brown on the surface, and brownish through the albedo and for a short distance inward on the divisions between the segments. Inoculations with the organism in injuries in the rind of oranges, lemons, and grapefruits gave a similar rot, with spots cinnamon-brown to Prout's brown on Valencia oranges, and mars brown on light green lemons in which the internal discoloration was similar in extent but darker than that due to *Alternaria citri*. The fungus was reisolated from the artificially infected fruit.

The optimum, minimum, and maximum growth temperatures of the fungus on glucose potato agar were, respectively, about 25°, above

7·7° but below 11·8°, and over 30·4° but under 35°. A similar relation was indicated for rate of decay on mature oranges and lemons, but with green fruits the rate of decay was not only lower at all temperatures tested, but the optimum temperature for lesion formation was much lower than on mature fruits.

The fungus, which belongs to the genus *Candelospora*, is characterized by conidiophores 14 to 23 μ long, occurring singly or severally on a torch-like hypha at a point 60 to 90 μ from its base; the conidiophore bears rami, metulae, sterigmata, and triseptate, cylindrical, obtusely ended conidia, 43 to 48 by 4·1 to 4·8 μ; the torch-like projection measures 240 to 275 μ long, 5 to 6 μ wide at the base, 2·5 to 3 μ wide at the narrowest point, and with swollen ends measuring 19 to 21 by 11 to 12·5 μ. No mucus was observed. The fungus differs from the only species of the genus previously known, *C. ilicicola*, in its smaller spores, fawn to vinaceous mycelium instead of white tufts, the lack of mucus in the heads, and the presence of torch-like hyphae from which conidiophores grow out. It is named *C. citri* n. sp. [with a diagnosis in English only].

Parker (E. R.). **Experiments on the treatment of mottle-leaf of Citrus trees. III.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 213–215, 1937.

In further investigations into the control of citrus mottle leaf in California [*R.A.M.*, xvi, pp. 93, 378], Washington Navel oranges receiving 32 different fertilizer treatments since 1927 were sprayed in March, 1934, with zinc sulphate and lime applied at a strength of 10–5–100 with 4 oz. of powdered blood albumin spreader added. The treated trees quickly improved, many showing decreased mottle leaf and increased vigour by June, 1934. The mean tree-condition index (based on the amount of mottle leaf present and degree of thriftiness) for all the different fertilizer treatments for the three years before the treatment was estimated at 42·3, the corresponding figures for the untreated and treated areas in February, 1935, being 53·3 and 79·4, respectively. The improvement brought about by the treatment was maintained in 1935-6. An increase in yield of about 6·5 per cent. resulted from the treatment in the crop of 1934, while the same trees in 1935 showed an increase in yield of 24 per cent. over the trees treated just before the 1935 crop was set, the increase in yield being much greater in the second than in the first season after treatment. The yields of the 1934 crop were increased by the zinc treatment in 25 of the 32 fertilizer treatments involving the application of 1 lb. nitrogen per tree. The 1935 crop was increased by the zinc treatment in 30 of the fertilizer treatments and the yield of the other two was nearly as large. The most severely affected trees showed improved yield and condition.

Dwyer (R. E. P.). **The diseases of Coco-nuts (Cocos nucifera) in New Guinea.**—*New Guinea agric. Gaz.*, iii, 1, pp. 28–93, 16 figs., 1937.

Full, popular notes, with numerous references to the relevant literature, are given on the causes, symptoms, and control of the diseases of coco-nuts observed in the Mandated Territory of New Guinea. These include bud rot (suspected to be present in the past but so far no species of *Phytophthora* has been identified on coco-nut); lightning-strike (causing false bud rot) [see above, p. 657]; root infections by *Ganoderma*

lucidum [*R.A.M.*, xv, p. 632], *Fomes lignosus*, and *F. noxius*; tapering stem (associated with soil erosion) [ibid., vi, p. 608; xvi, p. 300], chlorosis and die-back deficiency disease [see above, p. 657]; soft leathery kernel, suspected to be due to soil impoverishment; an obscure physiological trouble affecting palms five to eight years old in New Ireland and characterized by a pronounced tip withering of the central leaves, dying-back of the outer leaves, and pale brown streaks on the back of the petioles; nut fall, associated with environmental and soil conditions, insects, and various fungi; ring disease of immature nuts associated with *Botryodiplodia theobromae* [ibid., iv, p. 35]; head droop (corkscrew, cabbage droop, or strangle disease) [see above, p. 657]; frond choke (closely resembling little leaf of the West Indies) [ibid., xv, pp. 2, 128]; thread blights due to *Corticium penicillatum* [ibid., v, p. 716]; stem bleeding (*Ceratostomella paradoxa*) [ibid., xv, p. 15]; grey blight (*Pestalozzia palmarum*) [ibid., xvi, p. 529, and above, p. 657]; bacterial leaf blight due to an organism as yet unidentified; leaf droop, associated with poor soil; leaf break due to *Botryodiplodia*; tip wither [ibid., iv, p. 35] associated with *Botryodiplodia* and *Fusarium* spp., and 'silver leaf', causing a silvering of the leaf surface associated with an unidentified fungus.

Pfältzer (A.). **Culturmaatregelen in verband met eenige ziekten en plagen bij de Koffie.** [Cultural methods in connexion with some Coffee diseases and pests.]—*Bergcultures*, xi, 18, pp. 636–638, 1937.

In addition to the die-back of coffee branches associated with definite parasitic diseases, such as top die-back [*Rhizoctonia*: *R.A.M.*, xvi, p. 530, and next abstract] and pink disease [*Corticium salmonicolor*: ibid., xv, p. 345; xvi, p. 280], a form of this disorder may be induced in Java by adverse environmental conditions tending to disturb the equilibrium of the assimilatory functions. The health of trees suffering from this type of die-back may be improved by careful attention to the aeration and moisture of the soil, uniform shading, and restriction of bearing within reasonable limits.

Muller (H. R. A.). **Topsterfte van Koffie.** [Top die-back of Coffee.]—*Arch. Koffiecult. Ned.-Ind.*, x, 4, pp. 280–349, 3 figs., 5 diags., 1 graph, 1936. [English summary. Received May, 1937.]

This is an exhaustive, fully tabulated account of the writer's investigations in Sumatra from 1928 to 1930 on the top disease of young coffee trees and the die-back of older ones due to *Rhizoctonia* [see preceding abstract], supplemented by some later observations on the same phenomena.

Transverse sections through the wood of affected trees show concentric rings of brownish spots and patches due to gum deposits in the infected vessels. Both phases of the disease are accompanied by tracheomycosis, and the fungus has been isolated from the wood, stems, and twigs. Infection has been found invariably to commence in a growing twig and may frequently be detected before the hyphae spread into the stem; in such cases timely pruning may arrest the further progress of the disease. In the field the fungus travels from the leaves through the

wood vessels of the branches and stem. As a rule its diffusion is two to three times more rapid in an upward than in a downward direction.

Positive results were obtained in inoculation experiments with pseudo-sclerotia of the organism on 14 out of 50 unwounded and on 26 out of 50 wounded plants (28 and 52 per cent., respectively). No other species of *Rhizoctonia* being known to cause tracheomycosis, the agent of top die-back of coffee may be regarded as a new species, a technical description of which will be published elsewhere. In pure culture the fungus proved highly sensitive to temperatures exceeding 25° C., and could only be kept alive in the laboratory at Buitenzorg (mean temperature 26·5°) in an iceless refrigerator (23·4°). The inability of the *Rhizoctonia* to withstand great heat probably accounts for its confinement to altitudes higher than 300 to 400 m. above sea-level. The propagation of the organism is assisted by its capacity to remain alive for about seven weeks in excised diseased top, twigs, and leaves left in the open. Pseudo-sclerotia, consisting of interwoven chains of pseudo-conidia, have been found in such material in the field and shown to be able to produce normal fungal colonies, the hyphae of which penetrated the leaves in inoculation tests.

The presence of abundant shade (*Leucaena glauca*) was observed to minimize the incidence of top die-back, and a close correlation was traced between the number of fresh infections and the monthly rainfall. In the dry monsoon the trees infected in the preceding wet monsoon die off, while in the first months of the wet season the number of diseased trees remains nearly constant owing to the heavy reduction of fresh infections during the foregoing dry spell. The yields of diseased trees are 16 to 50 per cent. lower than those of healthy ones, the production of two- and four-stemmed trees exceeding that of one-stemmed by about 20 per cent.

Some 35 per cent. of the shoots from diseased trees are infected by the migration of hyphae from the stem, but hyphae are frequently absent from the stem base opposite the diseased branches. After pruning back the infected trees to some distance below the visibly affected branches, shoots destined to replace the main stem should be retained only at the base of the 'healthy' side. Working along these lines, it was possible to reduce the number of hyphal infections of shoots from the old stem to between 3 and 9 per cent. Pruning experiments showed that the excision of the first diseased branches reduces the loss of branches by 25 per cent. or so. If the whole top is affected the stem should be cut back below the visibly diseased parts and treated as described above; in the case of old trees, however, sound young shoots are not likely to be produced and pruning should be limited to the removal of infected branches until the tree becomes worthless and has to be replaced by a young one. All prunings should be burnt to prevent the spread of infection. In spraying and dusting experiments with copper compounds in 1932–3 in Kediri (Java), the number of fresh attacks was reduced by 50 per cent., but this method of control is more expensive and less effectual than pruning.

Top die-back has been observed to affect *Coffea robusta* and its vars. *quillou* and *uganda*, *C. canephora*, *C. congensis*, *C. excelsa*, *C. dybowski*, *C. liberica*, *C. abeocuta*, and *C. arabica* and its var. *margogype*, the

last-named species and variety, however, being definitely resistant (12 per cent. infection compared with 80 per cent. in *C. robusta*).

King (C. J.). **A method for the control of Cotton root rot in the irrigated south-west.**—*Circ. U.S. Dep. Agric.* 425, 9 pp., 3 figs., 2 diags., 1 map, 1937.

In the control of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xvi, p. 606] it is stated that a two- or three-year rotation with grain crops combined with deep tillage after the grain is harvested, has reduced the disease to some extent in Texas, while trench barriers containing mixtures of soil and heavy oils, ammonia, sulphur, and salt have also been used to limit the spread of the fungus. The following cultural method has proved very effective in Arizona for controlling the disease in irrigated cotton. Applications of organic materials are made in furrows 10 to 14 in. deep during the autumn and winter and covered by ploughing out the intervening ridges to form beds over the materials. Irrigation water should be applied immediately and, if possible, the operations should be completed at least a month before planting time, and a second irrigation made before planting. As much as 20 tons of horse or cow manure may be given per acre though 15 tons would probably be adequate for most soils; if green manure is available 30 tons per acre may be used. In experiments in 1935 only 1·6 per cent. of the cotton plants died on the treated plots compared with 56·2 per cent. for the untreated. The combined yield from control plots in 1932, 1933, 1934, and 1935, was 72, 54, 58, and 53 per cent., respectively, of that from the manured plots. In one experiment in 1935, after two years of treatment, the disease occurred on 9 per cent. of the treated area and on 50 per cent. of the untreated. The beneficial effects of the treatment, which should be continued for a period of years, are attributed to the inability of the root rot fungus to thrive in the presence of great numbers of soil organisms actively engaged in decomposing organic material.

Vasudeva (R. S.). **Studies on the root-rot disease of Cotton in the Punjab. III. The effect of some physical and chemical factors on sclerotia formation.**—*Indian J. agric. Sci.*, vii, 2, pp. 259–270, 3 graphs, 1937.

Further studies on the cotton root rot in the Punjab caused by *Rhizoctonia bataticola* [? *Macrophomina phaseoli*] and *R.* [*Corticium*] *solani* [*R.A.M.*, xvi, p. 96] showed that for each fungus growth was about equal on Richards's agar and cotton root extract and synthetic agars, but that sclerotial formation was favoured by the last two media and was poor on Brown's agar. Both *M. phaseoli* and to a less extent *C. solani* manifested a positive correlation between the concentration of the medium and intensity of sclerotial formation. With *M. phaseoli* very few sclerotia developed on shallow media, sclerotial formation increasing progressively with increased depth of the medium, while with *C. solani* sclerotia were formed only on deep medium. *M. phaseoli* showed intense sclerotial formation on media with a P_H range of 3·3 to 7·8, there being a considerable reduction in the number but increase in the size of the sclerotia at P_H 7·8, while for *C. solani* P_H 6·8 was the

optimum for sclerotial development which declined on either side of this value. In the absence of either sugar, nitrogen, or phosphate, growth was poor and no sclerotia developed except a few on the sugarless medium. Synthetic media containing nitrogen in the form of ammonium salts exercised a toxic effect, while those containing calcium nitrate and peptone gave the best growth. The sclerotia of *C. solani* lost their viability when exposed to 3 per cent. ammonium hydroxide solution for five minutes, and those of *M. phaseoli* were killed by ten minutes' exposure to a 4 per cent. solution. The growth of both fungi was checked by the addition of 0·09 per cent. mercuric chloride, 0·3 per cent. copper sulphate, or 0·5 per cent. phenol solutions to the medium. Exposure to hydrocyanic gas killed the sclerotia under moist conditions within 45 minutes, whereas those exposed when dry were viable after a week. The gas killed the sclerotia of both organisms in moist soil down to a depth of 18 in. within six days.

Derrett-Smith (D. A.). **A portable ultra-violet fluorescence lamp for the examination of textile and other materials.**—*J. Text. Inst., Manchr*, xxviii, 5, pp. T 145–T 160, 8 figs., 1937.

An ultra-violet fluorescence lamp, the 'Vi-tan' (Thermal Syndicate, Wallsend), designed for the detection of causes of defects in textiles, consists of a vitreosil mercury vapour burner with solid electrodes and neon as an exciter, in a metal housing, and is very portable, readily permitting the scanning of pieces of material. Among the numerous applications of the lamp described by the author is the determination of distribution of mildew causing staining, fluorescent spots due to mildew and the 'tide marks' indicative of wetting being rendered clearly visible.

Tarr (H. L. A.). **Brood diseases of the Bee.**—*Tabul. biol., Berl.*, xiv, 2, pp. 150–185, 2 graphs, 1937.

The available information on brood diseases of the bee, including the two fungal disorders, chalkbrood (*Pericystis apis*) [*R.A.M.*, xv, p. 217] and stone brood (*Aspergillus flavus*) [ibid., xi, p. 180], is presented in tabular form and briefly discussed in relation to current researches in Europe, Canada, and the United States. The bibliography comprises 53 titles.

Gimingham (C. T.). **Hover Flies killed by a fungus.**—*Trans. Herts. nat. Hist. Soc. Fld Cl.*, xx, 3, pp. 155–156, 1937.

In August, 1936, flower heads of oats and plantains [*Plantago* spp.] in a waste corner of a field on the Hertfordshire–Bedfordshire boundary were observed to be covered with dead hover flies (Syrphids of the genus *Melanostoma*, probably *M. mellinum*), which had been killed by a fungus identified by T. Petch as *Empusa muscae* [*R.A.M.*, viii, p. 720]. A striking feature of the epidemic was the immense number (many thousands) of insects involved; frequently they occurred in dense clusters and hung in chains from the plants over an area of 30 to 40 sq. yds.

Charles (Vera K.). **A fungus on Lace Bugs.**—*Mycologia*, xxix, 2, pp. 216–221, 2 figs., 1937.

Lace bugs (*Leptopharsa heveae*) have recently been killed off in large numbers in Brazil by a fungus producing a film of mycelium over the insects. The fungus is characterized by white, later pale yellow or pale fuliginous hyphae 6 to 10 μ in diameter; erect, simple, tapering conidiophores, 100 to 450 μ long; 3 to 6 verticillate, flask-shaped phialides, 20 to 28 by 4 to 7 μ, attenuated into a sterigma 8 to 15 μ long; and apical, hyaline, oval conidia, 6 to 8 by 4 to 5 μ, which appeared to be pip-shaped owing to the presence of a gelatinous substance round them. The insects were attached to the under surface of the leaves by irregularly digitate rhizoids, which occasionally became septate, showing rhomboid, thick-walled cells.

The arrangement of the phialides was strikingly varied. Opposite phialides were occasionally noted, and single ones sometimes occurred at irregular intervals along the mycelium. In a few cases a second phialide developed from the basal cell of the original one and produced a spore, and in some instances a second sterigma developed from the upper part of the phialide. The wall was usually entire, but an occasional phialide or group of phialides showed protuberances about 4 μ long.

The fungus has certain affinities with Petch's *Verticillium hemipterigena* and his *Cladobotryum ovalisporum* but the former differs in the size and shape of the conidiophores, phialides, and spores while the sterigmata of the latter, though bearing some resemblance to the projections on the phialides of the author's fungus, are smaller and more nearly cylindrical, and the conidia are shorter. The author considers that the fungus most closely approaches *Hirsutella* and accordingly names it, with a Latin diagnosis, *H. verticillioides*.

Dósa (A.). **Über das Trichothecium roseum.** [On *Trichothecium roseum*.] —*Derm. Wschr.*, civ, 18, pp. 548–549, 4 figs., 1937.

Trichothecium roseum, previously reported by Olàh in connexion with his studies on miscellaneous skin disorders in Hungary [*R.A.M.*, xiv, p. 694], appears to be unknown elsewhere as a human pathogen. The writer has also detected the fungus in one or two cases of superficial dermatological affections at Szeged. The cultural characters of the fungus are described. A vaccine prepared from the mycelium produced a reddening of the skin on subcutaneous injection into normal persons, while guinea-pigs reacted by persistent alopecia to the intracutaneous introduction of a sodium chloride suspension of the fungus, which was recovered from the affected area.

Klein (J. E.). **The relation of fungus infection of grain crops to vasomotor disturbances in man.**—*Ann. intern. Med.*, x, 11, pp. 1708–1715, 6 figs., 1937.

Following a brief introductory survey of previous literature on the insufficiently recognized relationship between the fungal contamination of cereal crops and human pathology, the writer reports the detection of *Claviceps purpurea* [*R.A.M.*, xvi, p. 447] conidia in samples of commercial rye flour and 'pumpernickel' bread [ibid., xii, p. 88], and of

Ustilago zeae spores in maize meal purchased in the retail market [ibid., xv, p. 223]. The possibility of grain fungus intoxication being a factor in the obscure etiology of acrodynia and other vasomotor disturbances is discussed and the reduction of such infections by modern chemical seed treatments and improved milling methods is urged.

Payenneville (J.) & Rivalier (E.). **Un cas d'épidermophytie exotique.** [A case of exotic epidermophytosis.]—*Ann. Derm. Syph., Paris*, Sér. 7, viii, 5, pp. 378–392, 7 figs., 1937.

A full account is given of the clinical manifestations and cultural and morphological characters of *Trichophyton rubrum*, isolated from extensive reddish lesions, suggestive of marginate eczema, in a French workman who had apparently contracted the infection two years previously in Indo-China [*R.A.M.*, xvi, p. 459]. Cultures of the fungus on various nutrient media, including glucose, beer wort, and cereal water agar demonstrated the extreme variability of the species. The abundant spindles are elongated, with blunted ends, consisting of 6 to 15 cells superimposed one upon another, sometimes straight but more often vermiform or sausage-shaped. They are borne laterally on the mycelium or terminally in groups on secondary branches on a short main branch; in the former case the spindles are sessile, in the latter pedunculate. Piriform aleuria also occur, while bi- to triseptate buds, constituting a transitional stage between the two organs, have also been observed.

Oläh (D.). **Una nuova specie di Perikonia, la 'Perikonia keratitidis Oläh'.** [A new species of *Periconia*, '*Periconia keratitidis* Oläh'.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, ix, pp. 155–159, 1937. [Latin summary.]

A description is given of a new species of *Periconia*, named *P. keratitidis* [with a Latin diagnosis] isolated from a case of human keratitis in Hungary. In culture the fungus forms on various media downy zonate colonies with a greyish-white, raised centre surrounded by a brown or nearly black zone, and then by a membranaceous, turbid, or waxy and powdery outermost zone. The hyaline or yellowish-brown, dichotomously branched hyphae measured 5 to 6·4 μ in diameter, while the erect conidiophores, 64 to 82 μ long, were hyaline towards the base, darker near the swollen apex, which was sometimes very finely toothed, and bore 12 to 18 ovoid or ellipsoid hyaline or light brown conidia measuring 12 to 19 by 7 to 10 μ. Inoculations of this organism into the cornea of a guinea-pig gave positive results.

Bernton (M. S.) & Thom (C.). **The role of Cladosporium, a common mold, in allergy.**—*J. Allergy*, viii, 4, pp. 363–370, 1937.

Details are given of subcutaneous injection tests on four patients (two adult males and two female children) to determine the part played by a species of *Cladosporium* in the excitation of allergic conditions associated with chronic hay-fever and asthma [cf. *R.A.M.*, xvi, p. 533]. In all cases the administration of 0·05 c.c. of fungal extract in the dilution of 1 in 10,000 gave rise to a diffuse, inflamed swelling, 2 to 4 in. in diameter, at the site of injection, a result considered to justify the

employment of the extract in a course of desensitization treatments, which were highly successful in three out of the four patients. In this connexion mention is made of observations by H. M. Cobe (*J. Allergy*, iii, p. 389, 1932) and E. F. Guba (*Flor. Rev.*, lxxviii, p. 32, 1936) as to the development of similar pathological conditions in greenhouse workers exposed to contact with tomatoes infected by *C. fulvum* [see above, p. 659].

This paper was followed by a discussion in the course of which information as to the distribution of fungal allergic excitants in various regions of the United States was imparted by workers in the same branch of medicine.

Novogrudski (D.), Berezova (Mme E.), Nakhimovskaya (Mme M.), & Perviakova (Mme M.). **The influence of bacterization of Flax seed on the susceptibility of seedlings to infection with parasitic fungi.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xiv (*1937*), 6, pp. 385–388, 1937.

A brief outline is given of experiments, the results of which showed that the inoculation of diseased flax seed with strains of soil-inhabiting bacteria capable of lysing species of *Fusarium* and *Colletotrichum* [*R.A.M.*, xvi, p. 204] considerably decreased the number of diseased seedlings grown under laboratory conditions from the seed of one of the varieties tested (No. 364) but had no effect on the other (No. 609). Certain other strains, however, had a different effect, causing the death of all seedlings of 364 but reducing disease in those of 609, while a third group reduced the number of diseased seedlings of both varieties. Treatment with *Bacillus* [*Pseudomonas*] *fluorescens* and *B. mesentericus* reduced disease in 364 but had no appreciable effect in 609, *B. megaterium* [ibid., xv, p. 395] reduced disease in both varieties, while *B. mycoides* as a rule increased disease. The authors conclude that it is possible by bacterization to reduce very considerably the number of diseased seedlings.

Rost (H.). **Die Pasmo-Krankheit des Leins in Europa. [Erreger: Septoria linicola (Speg.) Garassini.]** [The 'pasmo' disease of Flax in Europe caused by *Septoria linicola* (Speg.) Garassini.]—*Angew. Bot.*, xix, 2, pp. 163–171, 3 figs., 1937.

The 'pasmo' [spasm] disease of flax caused by *Septoria* (*Phlyctaena*) *linicola* [*R.A.M.*, xv, p. 441] was observed for the first time in Europe in 1936, when it was responsible for heavy damage in Yugoslavia. In inoculation experiments at the Biological Institute, Berlin-Dahlem, with material of the fungus from the Banat, flax seed sown in infested soil was largely destroyed. The organism is a typical *Septoria*, with black, ostiolate pycnidia, 65 to 128 μ in diameter in nature and up to 500 μ in culture, and hyaline (crimson with an ochraceous tinge in the mass), elongated, cylindrical, straight or irregularly curved, mostly triseptate pycnospores, 21·7 to 2·8 μ. Good growth is made on potato juice agar at 5° to 31° C., with an optimum at 20°. The most conspicuous feature of the disease is a brown spotting, sometimes commencing at the cotyledonary stage and involving the leaves, stems, sepals, and ovaries. Control should be based on field sanitation, crop

rotation, and the use of healthy seed, disinfection of the seed by fungicidal dusts having proved ineffectual.

HÜBNER (H. J.). **Kampf dem Vermehrungspilz!** [Control the propagation fungus!]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 19, p. 211, 1937.

Having observed that *Pythium de Baryanum*, *Moniliopsis aderholdi*, and other 'propagation fungi' are particularly rife in soils containing a high proportion of humus, the writer uses pure sand for the uppermost layers of his seed-beds [see above, p. 659], while disinfection of the peat-sand mixture commonly used for cuttings has been found advisable, since peat is by no means invariably free from fungi; the sterility of sand and its deficiency in nutrient substances exclude all possibility of fungal development. During the rotting process compost heaps are liable to invasion, not only by beneficial but also by noxious micro-organisms, the spread of which should be checked by repeated turning-over of the soil with an admixture of caustic lime.

BURKHOLDER (W. H.). **A bacterial blight of Iris.**—*Phytopathology*, xxvii, 5, pp. 613–621, 1 fig., 1937.

This is an expanded account of the bacterial leaf blight (*Bacterium tardicrescens*) of *Iris germanica*, *I. florentina*, and *I. fulva*, observed in 1934–5 at Ithaca, New York, a preliminary note on which has already been published [*R.A.M.*, xvi, p. 463]. On beef extract-peptone agar cultures the organism measures 1·58 by 0·68 μ and forms circular, entire, mustard-yellow colonies. Brom-cresol purple milk is slowly alkalized and ultimately cleared. Gelatine is not liquefied. Nitrates are reduced to nitrites. Ammonia and a trace of hydrogen sulphide is produced, but no indol. Levulose, galactose, arabinose, xylose, rhamnose, and the sodium salts of citric, malic, and succinic acids are fermented, but starch is not hydrolysed. Inoculation experiments with the organism on plants in the greenhouse were successful provided the leaf was injured and the inoculated plants were kept in a humid atmosphere. Attempts to infect iris rhizomes, various plants related to the iris, and the hosts of the allied pathogens gave uniformly negative results.

KOTTHOFF (P.). **Verticillium coccorum (Petch) Westerdijk als Parasit auf Puccinia chrysanthemi Roze.** [*Verticillium coccorum* (Petch) Westerdijk as a parasite on *Puccinia chrysanthemi* Roze.]—*Angew. Bot.*, xix, 2, pp. 127–130, 2 figs., 1937.

Attention is drawn to the parasitization of *Puccinia chrysanthemi* on Golden Seal chrysanthemums [*R.A.M.*, xv, p. 583] in a Westphalian nursery by *Verticillium* (*Cephalosporium*) *coccorum* [ibid., v, p. 97]. The profuse verticillate branching of the fungus in old cultures of the fungus led to its transference by Miss Westerdijk from *Cephalosporium* to *Verticillium*, other species of both of which genera have recently been found attacking cereal rusts in Germany [ibid., xvi, p. 237]. *P. chrysanthemi* was successfully inoculated with the *Verticillium* in the laboratory, but considerable difficulties were presented by the operation in outdoor stands. The parasite penetrates the leaf tissues through the rust pustules, causing a dark brown discoloration and necrosis round the

site of infection, but is not pathogenic to healthy foliage. *V. coccorum* made profuse growth on coccids on apple twigs, and on *Aspidiotus hederae* on *Asparagus plumosus*.

KUNKEL (L. O.). **Effect of heat on ability of Cicadula sexnotata (Fall.) to transmit Aster yellows.**—*Amer. J. Bot.*, xxiv, 5, pp. 316–327, 2 figs., 1 graph, 1937.

Viruliferous colonies of *Cicadula sexnotata* exposed to temperatures of approximately 31° or 32° C. for one to eleven days temporarily lost their ability to transmit aster (*Callistephus chinensis*) yellows [*R.A.M.*, xvi, p. 622] but regained it after periods ranging from a few hours to many days, while colonies exposed to the same temperatures for twelve days or more became permanently unable to transmit the disease. The period required to regain transmissive ability increased with the period of exposure to heat. The colonies in which the virus was undergoing natural incubation were more adversely affected by the heat treatment than colonies already infective at the time of treatment.

Prolonged heat treatments apparently inactivate all the virus carried by infective insects, short exposures causing inactivation of part of the virus only. The time required for a resumption of infectivity appears to be a heat-induced incubation period, during which the uninactivated portion of the virus multiplies sufficiently to restore infectivity. The unusually long incubation periods in plants exposed to insects that have recently recovered their ability to transmit the virus suggests that these insects carry less virus than those long infective. The isolation of mild strains of the virus by the heat treatment [loc. cit.] indicates that heat exerts a selective action on the viruses of mild strains. Three such strains were shown to remain unchanged on further transmission. The mild strains manifested varying degrees of mildness and differed from typical yellows in causing less severe chlorosis, slight erectness in growth habit, little stunting or distortion, and less branching of secondary shoots. The rate of spread of the disease under field conditions was greatest late in the season when, however, the plants were relatively resistant because approaching maturity, and when the insects were less numerous than at midsummer. The experimental data obtained suggest that midsummer temperatures may inactivate much of the virus carried by the leafhoppers, temperature effect being responsible for the late seasonal rise in rate of spread. [In an abstract in *J. Bact.*, xxxiv, 1, p. 132, 1937, the author records the isolation of 12 mild strains by heat treatment of the vector.]

GREEN (D. E.). **Antirrhinum rust. III. Rust-resistant strains of Antirrhinums.**—*J. R. hort. Soc.*, lxii, 5, pp. 214–219, 1937.

Continuing his investigations at the Royal Horticultural Society's Garden, Wisley, Surrey on the control of *Antirrhinum* [*majus*] rust (*Puccinia antirrhini*) [*R.A.M.*, xv, p. 442; xvi, p. 387], the writer in 1936 tested the possibilities of combating the disease by the use of resistant strains—some raised at the Garden from American seed and others procured direct from the United States. All the former, which differed widely in growth habit, flower colour, and the like, displayed a high degree of resistance (61 to 100 per cent., the latter figure being

recorded for two stocks, Nos. 3 and 12), while only one of the American strains was highly susceptible and seven were entirely rust-free. The degree of resistance in 12 ordinary stocks included in the test for comparative purposes ranged from 0 to 62 per cent.

PALM (B. T.). **Puccinia antirrhini Diet. et Holw. på Öland.** [*Puccinia antirrhini* Diet. & Holw. on Öland.]—*Svensk bot. Tidskr.*, xxxi, 2, pp. 288–289, 1937. [English summary.]

Snapdragon [*Antirrhinum majus*] plants raised from seed on the island of Öland, Sweden, were found in August, 1935, to be infected by rust (*Puccinia antirrhini*) [see preceding abstract], a new record for the country. Although there is a remote possibility that the spores of the rust may have been conveyed by air currents from the nearest site of infection, presumably Denmark [*R.A.M.*, xiv, p. 239], it is considered more likely that the seed itself constituted the source of contamination.

KAMMERER (F.). **Einfaches Mittel gegen Hortensienmehltau.** [A simple remedy for Hydrangea mildew.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 20, p. 224, 1 fig., 1937.

Perfect control of hydrangea mildew [*Microsphaera polonica*: *R.A.M.*, xiv, p. 426] in Dresden nurseries is stated to be obtainable by sulphur fumigation, the sulphur being applied in dust form to all the greenhouse hot-water pipes.

KEAY (MARGARET A.). **An undescribed species of Sclerotinia.**—*J. Bot., Lond.*, lxxv, 893, pp. 130–132, 1937.

In November, 1933, a species of *Sclerotinia* was isolated by F. T. Brooks from diseased *Gypsophila elegans* plants grown commercially in Bedfordshire and showing a rot of many leaves and stems near the ground. Experimental evidence demonstrated that the fungus was strongly pathogenic to *G. elegans*, *Lychnis alba*, *Silene gallica*, *S. maritima*, *Spergula arvensis*, and *Stellaria media*, and weakly parasitic to lettuce, young peas, broad beans (*Vicia faba*), and chicory.

In culture the fungus forms a fluffy white mycelium which becomes slightly buff with age; often a black plectenchymatous tissue develops, from 1 to 3 mm. in thickness, and may bear extremely warty sclerotia on its surface. On 5 per cent. malt extract agar the minimum, maximum, and optimum growth temperatures were, respectively, 0°, 25°, and 20° C. On Dox's agar the sclerotia gave rise to apothecial stipes, the tips of some of which became swollen and urceolate when exposed to light, and the inner and outer surfaces were covered with globose, hyaline microconidia 2·8 to 5 μ in diameter; microconidia also developed on all the media used. A few of the urceolate tips formed disk-shaped apothecia with asci and these structures were also obtained by burying sclerotia in damp sand.

The fungus was characterized by cylindrical to cylindroclavate asci, 155 to 270 (average 194) by 11 to 22 (16·4) μ, unthickened at the top, the tip not stained blue with iodine, protruding slightly beyond the paraphyses at maturity, and containing 8 irregularly uniseriate, hyaline, irregularly oval ascospores, with one end slightly more pointed than the other, measuring 14 to 26·6 (average 20·65) by 6·8 to 17·2

(10·12) μ. The clavate paraphyses were 4 to 5 μ broad. The black, warty sclerotia measured 2 to 10 by 2 to 5 mm.

The fungus differed conspicuously from *S. sclerotiorum*, *S. trifoliorum*, and *S. minor* in pathogenicity and also in cultural characters and the size of the sclerotia. It is regarded as a new species of *Sclerotinia* and is named *S. serica* [with a Latin diagnosis].

Köhler (E.). **Weitere Untersuchungen über das Virus der Lupinenbräune.** [Further studies on the Lupin browning virus.]—*Z. Pfl-Krankh.*, xlvii, 2, pp. 87–97, 7 figs., 1937.

The author presents further experimental evidence in confirmation of his earlier observations as to the identity of the lupin 'browning' virus [*R.A.M.*, xv, p. 510] with Ainsworth's yellow mottle mosaic of cucumber (Johnson's cucumber virus 1) [ibid., xv, p. 102] and spinach mosaic [ibid., xiv, p. 671]. The virus is not only very prevalent annually on lupins at the Berlin-Dahlem Experiment Station but has also been isolated from mosaic cucumber and tobacco plants. The weaker variant of the virus obtained from the latter host acquires renewed virulence by passage through cucumber. Negative results having been given by transmission experiments with the lupin browning virus to peas and other Leguminosae, its identity with 'sore shin' may be regarded as problematical. Inoculation tests on young mangolds gave weakly positive results.

McLarty (H. R.), Wilcox (J. C.), & Woodbridge (C. G.). **A yellowing of Alfalfa due to boron deficiency.**—*Sci. Agric.*, xvii, 8, pp. 515–517, 1937. [French summary.]

Lucerne in the interior of British Columbia commonly shows a light green or yellowish discoloration [*R.A.M.*, xvi, p. 589] evenly distributed over the intercostal area of the leaves, or taking the form of streaks parallel to the veins if the leaf becomes affected only when fully developed. In severe cases the yellowing may affect the growing points, the new leaves being quite yellow, dwarfed, and showing practically no growth at the tip. Many of the leaves turn bronze or reddish, and some show both yellowing and bronzing. As a rule the midrib and veins remain green, and the discoloration becomes less conspicuous as it spreads towards the base. The edge of an affected leaf often turns whitish, and the marginal tissue dies, shrivels, and curls upward. The first growth in spring or after cutting is generally normal, and as a rule the upper leaves turn yellow only when well formed and the lower ones after the upper ones. The internodes are shortened and the plants stunted and squat.

Boric acid and borax were scattered on 7th and 25th March, 1936, at rates ranging from 2 oz. to 4 lb. per tree, round the base of apple trees in an orchard where affected lucerne had been grown as a cover crop for some years. On each occasion the 2 oz. application slightly improved the colour and growth of the lucerne, the 4 oz. application markedly improved them, and the best result was given by the 8 oz. application; burning, however, was caused by all applications of 4 oz. or over, injury progressively increasing with increase in dosage. The lucerne outside the areas treated remained sickly. Chemical analysis showed the boron

content of the yellowed plants to be consistently lower than that of green ones.

Bennett (F. T.). **Dollar spot disease of turf and its causal organism Sclerotinia homoeocarpa n. sp.**—*Ann. appl. Biol.*, xxiv, 2, pp. 236–257, 3 pl., 4 figs., 1937.

Dollar spot, attributed formerly to *Rhizoctonia monteithianum* [*R.A.M.*, xiv, p. 449], has been found to be distributed throughout Great Britain, though it is not nearly so frequent as *Fusarium* patch [*Calonectria graminicola*: ibid., xvi, p. 468] while brown patch (*Corticium vagum*) [*C. solani*: loc. cit.] is apparently rare. Dollar spot occurs most frequently during the mild, wet early autumn following fewer spots in the dry late summer. The spots are circular, about 2 in. in diameter, and coalesce to form large irregular patches, brown at first but becoming of bleached straw colour.

Isolations yielded a fungus with well-developed white, woolly, aerial mycelium, the undergrowth turning cinnamon in from four to six weeks, and subsequently reddish-brown. Olivaceous to black sclerotia form beneath or at the edge of the reddish-brown mycelium; they are of parchment-like thickness and increase in size from small flakes until eventually covering much of the surface. Sporophores appear when the cultures are about two months old, arising either from the edge of the flake sclerotia as minute, bulbous structures with short necks, or more commonly from the large sclerotial masses, the necks protruding as black bristles or blunt projections. Within two or three months the sporophores elongate to pale cinnamon stalks, 4 to 10 mm. long, with blunt, dark apices. Eventually the sporophores become conidiophores, ascophores, or remain sterile. Conidiophores are formed by the blackish apex swelling to a knob-like structure which opens to form a cup about 0·5 mm. in diameter with a broken or irregular, dark-coloured rim, bearing conidia singly at the tips of hyphae lining the inner surface of the cup. The conidia are hyaline, oblong, bicellular, constricted at the septum, narrowed towards the base, with a rounded or bluntly pointed apex, 15·6 to 20·8 by 4·5 to 5·2 μ. Ascophores are freely developed on oat and wheat grains in moist Petri dishes (after 9 and 15 months, respectively). The apothecium may resemble the conidiophore in general appearance, or may develop disk or funnel forms, 1 to 1·5 mm. across. The asci are cylindro-clavate, 140 to 170 by 10·4 to 11·5 μ, and the hyaline, oblong-elliptical, unicellular ascospores, 16 to 17 by 5·2 to 6·5 μ. Paraphyses are sparse. Another strain developed the ascigerous stage but not the conidial, but formed minute cream-coloured pustules of spherical microconidia (1·5 to 2·0 μ in diameter) on cereal grains. Two other British isolations were non-sporing, as were also Monteith's strain received from the United States (*Rhizoctonia* sp.) [ibid., v, p. 742] and Simmonds's strain [*R.* sp.: ibid., xv, p. 445] from Queensland. All these strains are regarded as belonging to the same fungus, which is considered to be a new species of *Sclerotinia* and is named *S. homoeocarpa* with a Latin diagnosis.

The optimum temperature for growth of the British strains is 20° to 25° C. and the minimum 0° to 1°. The American strain has an optimum of about 30° and neither the American nor Australian strain grows at

0° to 1°; all strains have a maximum of 35° to 37°. The British strain is regarded as better adapted to cool conditions than the American.

Hoagland (D. R.), Chandler (W. H.), & Stout (P. R.). **Little-leaf or rosette of fruit trees. VI. Further experiments bearing on the cause of the disease.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 210–212, 1937.

In continued experiments on little leaf of fruit trees [*R.A.M.*, xvi, p. 259], using soil from the same diseased peach orchard as formerly [ibid., xv, p. 730 and next abstract], 'white bud' was again induced on maize, and was prevented by the application of zinc sulphate, but not by sheep, chicken, or cow manure low in zinc. Soil sterilization in an autoclave prevented the appearance of the disease in maize, as did soil treatments with formaldehyde and ether. When a small amount (1 or 2 per cent.) of unsterilized soil was mixed with the sterilized the disease reappeared and was again overcome by the addition of zinc sulphate. When apricot seedlings and maize plants were grown in tanks containing the little leaf soil between lucerne plants that had been established about a year, the growth of the apricot and maize plants was retarded as compared with that in soil treated with zinc sulphate, but practically no little leaf or white bud symptoms developed, though the apricot and maize plants in the control tank were markedly affected. The lucerne showed no sign of the disease, indicating that it absorbs adequate amounts of zinc from the soil used in the test. When two successive maize crops were grown in soil treated with heavy applications of urea no disease appeared. In another test, when the roots of a tomato crop were allowed to decompose in the soil, the second crop of maize following the tomato crop showed no symptoms. Light and temperature greatly influence the effects on plants of this soil or of solutions deficient in zinc. Analyses indicated that typically diseased plants are almost always relatively low in zinc.

The data obtained in two years' work suggest that zinc deficiency is the immediate cause of little leaf and related diseases, though in some cases zinc deficiency in the plant may result from the activities of soil micro-organisms. The possibility that direct toxic effects may also be present in severe forms of the disease is not excluded.

Ark (P. A.). **Little-leaf or rosette of fruit trees. VII. Soil microflora and little-leaf or rosette disease.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 216–221, 7 figs., 1937.

In a two years' detailed study of the microflora of soils bearing normal and little leaf plants using Cholodny's slide and the dilution plate methods [*R.A.M.*, xv, p. 334], it was found that little leaf soils incubated under partly anaerobic conditions became very toxic to maize, tomato, cotton, and peach, though the toxicity was destroyed by steam sterilization [see preceding abstract]. When little leaf soil was inoculated into quartz sand cultures and maize seedlings were planted, the zinc content of the culture solution being low, the plants in the sand culture with non-sterilized soil developed white bud, while others in the sand plus sterilized soil and sand with no soil remained normal for six weeks.

Three species of bacteria, referred to as Chr, D 16, and 2722, were very numerous and appeared somewhat consistently in platings of soil samples from the root zone of diseased plants. Maize seeds sown in little leaf soil treated separately with D 16, 2722, and a mixture of both, germinated very slowly as compared with the controls in sterilized soil, and were stunted and chlorotic. The cultures D 16, 2722, and a mixture of both, when inoculated into a complete culture solution containing 0·023 p.p.m. of zinc, produced symptoms of white bud in maize seedlings, the condition being consistently corrected by increasing the amount of zinc to 0·046 p.p.m. or injecting zinc sulphate into the stems.

In preliminary tests with peach seedlings grown in sand culture and walnuts in little leaf soil, each series was inoculated with 2722, and developed symptoms resembling those of little leaf in the field; the presence of zinc prevented the appearance of such symptoms.

Perlberger (J.). **Rhizoctonia bataticola (Taub.) Butler in deciduous fruit nurseries in Palestine.**—*Palest. J. Bot. hort. Sci.*, i, 3, pp. 37–51, 2 pl., 1937. [Hebrew abstract.]

All varieties of deciduous fruit trees grown in Palestine nurseries, including apple, pear, quince, apricot, peach, almond, plum, myrobolan [*Prunus divaricata*], cherry, and walnut (*Juglans nigra*), are liable to infection by *Rhizoctonia bataticola* group B [*R.A.M.*, ix, p. 685], a culture belonging to group A (*R. lamellifera*) [ibid., xiv, p. 233] being obtained on one occasion only, from Douçain apple. The disease is of much economic importance, sometimes destroying up to 60 per cent. of the young trees.

Infection occurs chiefly during summer, the first symptom being a sudden wilting and blight of the leaves, which, however, do not fall for several weeks. The fungus attacks the young nursery stock at the root crown, causing in many cases the formation of a blackish-brown girdle, 2 to 3 mm. above or below the ground. The infected girdle is marked off from the lower part of the main root by a smooth line, but there is no clear line of demarcation between the diseased and healthy parts of the stem on the upper boundary. The browning usually spreads upwards until all the upper part of the tree has wilted. The main root below the black line in the wood and the brown ring may produce new roots and sprouts, but as a rule the rot attacks the entire root system, the secondary roots, and the root hairs.

Out of 231 cultures made from affected trees 78 gave *R. bataticola* only, 30 *R. bataticola* in association with another fungus, and the rest were negative. This is the first record of *R. bataticola* on young deciduous fruit trees; it was not found on mature trees. Inoculation experiments have not yet been carried out.

The epidemic summer mortality due to the disease is largely confined to the coastal parts of Palestine, where the cultural methods differ from those used in the hills. Most of the young trees are introduced from France and northern Italy and become weakened by new and unfavourable climatic conditions, the root collar in the upper layer of the soil being liable to suffer damage from the heated soil. It was further observed that budding operations rendered the trees susceptible to infection. Preliminary tests indicated that infection may be prevented

by budding in autumn instead of summer, after two applications to the stems of 3 or 4 per cent. Bordeaux mixture.

Küthe (K.). **Zur natürlichen und künstlichen Infektion des Apfelschorfes, Venturia inaequalis (Cooke) Aderhold, und seiner Bekämpfung.** [On natural and artificial scab infection of Apple, *Venturia inaequalis* (Cooke) Aderhold, and its control.]—*Z. Pfl-Krankh.*, xlvii, 4, pp. 193–211, 2 figs., 3 graphs, 1937.

From his recent studies at the Landsberg (Warthe) Agricultural Experiment Station on the natural and artificial infection of apples by scab (*Venturia inaequalis*) [*R.A.M.*, xvi, p. 618 and next abstract] the author concludes that a correct timing of the pre-blossom spray application is essential to ensure the full efficacy of the treatment; the application should be made as late as possible before ascospore ejection, the later sprayings being much less important. Spray schedules should be modified so as to take into consideration the fact that new infections occur very largely in August. In view of the local variation in the time of spore discharge, observation stations should be established over the whole of Germany to determine the local spraying schedules. Preparations for use against scab can be usefully subjected to preliminary tests on young trees artificially infected and grown in the greenhouse. From his inoculation experiments he concludes that a monospore culture can infect several apple varieties, some more readily than others, while each variety can be attacked by several strains of the fungus. Reisolations from successful infections with a monospore strain on different varieties showed no deviation from the original culture on apple juice agar or yeast extract.

Keitt (G. W.) & Palmiter (D. H.). **Heterothallism in Venturia inaequalis.**—*Science*, N.S., lxxxv, 2212, p. 498, 1937.

In October, 1935, potted Fameuse apple trees forced in the greenhouse were inoculated with conidia from cultures obtained by isolating each of the eight spores of an ascus of *Venturia inaequalis* [see preceding abstract]. The conidia from each isolate were used singly and mixed in every possible combination of two. Infection resulted from all the inoculations, while uninoculated trees remained free from scab. The microscopic examination of overwintered leaves revealed no perithecia on the uninoculated material or on that inoculated with conidia from any single isolate of the fungus. The results of the two-isolate inoculations showed that the eight isolates fell into two groups of four each, all the 16 possible combinations between which yielded fertile perithecia. None of the eight combinations in which conidia from one isolate were mixed with those from another within the same group produced fertile perithecia, except in three instances believed to have been due to contamination. Cleared-leaf studies showed that perithecial rudiments were formed in profusion following inoculation by single isolates or sterile mixtures, but usually attained less than one-half the diameter of the normal mature perithecium. From these preliminary experiments *V. inaequalis* would appear to be heterothallic, each isolate being hermaphroditic and self-sterile.

Winkelmann (A.), Holz (W.), & Jaenichen (H.). **Beiträge zur Biologie und Bekämpfung des Apfelschorfes (Fusicladium dendriticum [Wallr.] Fckl.). III. Mitteilung.** [Contributions to the biology and control of Apple scab (*Fusicladium dendriticum* [Wallr.] Fckl.). Note III.]—*Zbl. Bakt.*, Abt. 2, xcvi, 9–12, pp. 177–191, 3 graphs, 1937.

The results of the writers' continued studies on the life-history and control of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*: *R.A.M.*, xv, p. 661 and preceding abstracts] in 1936 confirmed those of 1935. Both in the dry climate of Zossen and under the very humid conditions prevailing in the Lower Elbe fruit-growing district the perithecia of the fungus were mature by the end of March, the first ascospores being found in the air from the first three days of April to the beginning of June in the former, and from the 30th March to 14th May in the latter region. The development of the perithecia in foliage from the Lower Elbe water trenches was retarded by about a fortnight in comparison with that of the same organs from leaves in pots.

The application of nitrogenous salts to potted seedlings appeared to enhance susceptibility to scab, an observation confirmed by infiltration experiments in which Winter Golden Pearmain leaves were immersed in M/20 solutions of various substances, carefully evacuated, then inoculated, and held in a damp chamber for 14 days. Potash salts, on the other hand, tended to reduce the incidence of infection in pot tests. In inoculation tests with ascospores on one-year-old grafts higher infection percentages were obtained on a given variety with inoculum from the same than from another sort, but in the case of conidia the differences were less apparent.

In the Berlin district scab has so far been found attacking the branches of only one apple variety (Virginian Rose), on which conidia were produced on 22nd February, 1935, but in the Lower Elbe valley viable conidia were released on 3rd March from ruptured lesions on the branches of six varieties, including Beauty of Boskoop and Bismarck. This constitutes a factor of importance in the control of the disease [ibid., xvi, p. 470] and spraying must be initiated earlier where such infection occurs. At Zossen the postponement of fungicidal treatment owing to rain largely obviated its beneficial effects, which were fully experienced, however, in the Lower Elbe valley whenever the first application was made during or shortly after the initial ascospore discharge.

Bailey (J. S.) & Thies (W. H.). **Some observations on internal cork disease of Apples in Massachusetts.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 187–191, 1 fig., 1937.

In 1936, McIntosh and Cortland apple trees in at least twelve orchards in different parts of Massachusetts showed internal cork [*R.A.M.*, xvi, p. 470 and next abstracts], accompanied in the latter variety by a roughness of the surface. Observations made in seven widely separated orchards showed that the disease is not confined to any particular type of soil, but that it occurs wherever the subsoil is unfavourable to root penetration and is to some extent prevented by heavy mulching. Trees

in such soil would be unfavourably situated in time of drought and this association of the disease with water deficiency has already been reported by other workers. No data of the effect of boron on the disease are available for Massachusetts.

BURRELL (A. B.). **Boron treatment for a physiogenic Apple disease.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 199–205, 1937.

Studies conducted over a period of eleven years on the incidence of drought spot [*R.A.M.*, xvi, p. 589], internal cork, die-back, and rosette of apples in New York [ibid., xiv, p. 592 and preceding and next abstracts] showed that when the fruit symptoms appear within six weeks of petal-fall they are fairly constant for any given variety. Tolman Sweet is consistently free from drought spot and internal cork, but it very occasionally shows rosette and die-back. The usual symptom on McIntosh, Northwestern Greening, Rome Beauty, Northern Spy, Winter Banana, Baldwin, Cortland, and Lobo is drought spot, and on Fameuse, Rhode Island Greening, Duchess of Oldenburg, and Wealthy, internal cork. Northern Spy and Duchess of Oldenburg often show both cork and drought spot or a combination of them, and this sometimes applies to the other varieties. When the fruit symptoms appear at or after midsummer they usually take the form of internal cork in all varieties, and this symptom appears to be geographically more widespread than the others. Affected fruits may drop at any time during the season. Circumstantial evidence is given which strongly suggests that drought spot, internal cork, incipient die-back, die-back, and rosette are (under the conditions prevailing in New York) symptoms of a single disease.

Experiments are described on the treatment of the disease by boric acid injections, but these have already been noticed from another source [ibid., xvi, p. 471].

MCLARTY (H. R.), WILCOX (J. C.), & WOODBRIDGE (C. G.). **The control of drought spot and corky core of the Apple in British Columbia.**—*Bett. Fruit*, xxxi, 10, pp. 12–13, 1937.

The authors describe the symptoms of drought spot, corky core, rosette, and die-back disorders which have affected apple trees in British Columbia for some years [see preceding abstract]. The history of the investigations on the disease are briefly traced but not until 1934 was the discovery made that the disease is curable by feeding with boron [*R.A.M.*, xvi, p. 42]. The treatment was recommended to growers in 1935 and was uniformly successful. Tests in 1936 confirmed the earlier results in so far as concerned the injection method; spraying gave excellent control but caused some injury to the foliage. Soil applications of boric acid and borax gave perfect control of drought spot and corky core with no ill effects so far. None of the Okanagan Valley soils tested was high in boron, and it was also found that the smaller the boron content of McIntosh apple leaves, fruit, or twigs the more drought spot there was. The authors recommend autumn applications of boric acid evenly to the soil round affected trees and others in proximity to them at the rate of 30 lb. per acre, starting 2 or 3 ft. away from the trunk and continuing to the extreme limit of the limbs. The treatment

is also of benefit in cases of pear and apricot drought spot and plum gum spot [drought spot: ibid., v, p. 537; cf. also xv, p. 34].

ASKEW (H. O.), THOMSON (R. H. K.), & KIDSON (E. B.). **The boron status of New Zealand fruit soils.**—*N.Z. J. Sci. Tech.*, xviii, 11, pp. 789–796, 1937.

The results of analyses of a number of New Zealand soils for boron content are presented. In the top soils the values ranged from 0·15 to 2·20 p.p.m. of boric oxide. In general, the boron content falls with increase in depth of sampling, especially in Nelson soils. Internal cork of apples [see preceding abstracts] develops on soils of low boron content, and is also favoured by an open, free, or shallow soil, especially with underlying gravel or sand.

THOMAS (H. EARL). **Apple mosaic.**—*Hilgardia*, x, 14, pp. 581–587, 3 figs., 1937.

A mosaic disease of apple is recorded on the Ranvier variety at Paradise, California, in 1932, and on a single tree of Smith Cider at Berkeley in 1936, whilst it has also been observed on the Starking variety in California. The disease is probably identical with that known in the eastern United States [*R.A.M.*, xii, p. 636] and possibly in part with the mosaic mottling noted in Washington [ibid., xv, p. 345], but the illustrations accompanying the record from Bulgaria [ibid., xiv, p. 639] are considered by the author as more characteristic of non-infectious chloroses. In addition to the symptoms commonly seen on the apple a complete chlorosis of the larger vein (vein-clearing) is occasionally noticed. The disease was successfully transmitted by grafting to the varieties Golden Delicious, Gravenstein, Lady, Tompkins King, White Pearmain, and Yellow Newtown and also to *Cotoneaster harroviana*, loquat (*Eriobotrya japonica*), *Photinia arbutifolia*, rose, and *Sorbus pallescens*. While the incubation period may be as short as 53 days on the apple, the movement of the virus is slow, especially in *P. arbutifolia* and the rose. One rose plant did not show symptoms on all its branches after 27 months. In the orchard at Paradise, 22 of 53 of Ranvier trees were affected in July, 1935, and no new infections were found in May, 1936, while the disease at Berkeley has not spread to any other trees in the same garden. Heating dormant apple shoots failed to inactivate the virus.

HALLER (M. H.) & LUTZ (J. M.). **Soft scald of Jonathan Apples in relation to respiration.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 173–176, 1 graph, 1937.

When Jonathan apples were held for different periods at 70° F. before being stored at 32° the amount of soft scald [*R.A.M.*, xv, p. 811] that developed at the latter temperature increased to a maximum at 6 to 9 days' delay at 70°, and then decreased. The respiratory rate at 70° increased for a period and later decreased. No relationship was established, however, between the respiratory rate and the maturity of the fruit or between the respiratory rate at 70° at the time of transfer and the amount of soft scald that developed at 32°. These results are opposed to the hypothesis of Harding [ibid., xiv, p. 592] that the

respiratory activity of apples at the time of storage serves as an index of the storage capacity of the fruit, particularly with respect to soggy breakdown (of which soft scald has been regarded as one type) [ibid., xiv, p. 770].

Brien (R. M.). **The fungi associated with mouldy-core of Apples.**—*N.Z. J. Agric.*, liv, 5, pp. 283–286, 1 fig., 1937.

Mouldy core of apples [*R.A.M.*, xiv, p. 591], prevalent for many years in New Zealand, caused serious losses of Delicious apples in the 1934–5 season, leading to this attempt to determine the responsible fungi. At harvesting, external symptoms are confined to slight yellowing near the stem cavity, but later there is premature ripening and fruit fall, with slight bronzing round the crown. Internally, there is a zone of brown decayed tissue round the core, which may involve the whole fruit, and seeds and seed chambers are covered with hyphae.

Over 800 isolations of fungi were made. In fruits affected by mouldy-core alone *Gloeosporium perennans* [ibid., xv, p. 661] was present in 89·8 per cent., *Fusarium lateritium* var. *fructigenum* [*F. lateritium*: ibid., xiv, p. 40], *Septoria* sp., and *Phoma* sp. also being found. In fruits attacked by codling moth [*Cydia pomonella*] in addition to mouldy-core, *G. perennans* was recovered from 45·8 per cent., *F.* sp. (mainly *F. lateritium*, *F. culmorum*, *F. orthoceras*) from 15·5 per cent., *Penicillium* sp. from 10·3 per cent., while *Alternaria tenuis*, *Rhizopus* sp., *Epicoccum granulatum*, and *Pleospora* sp. were also found. Of these fungi, *G. perennans*, *F. lateritium*, *A. tenuis*, *R.* sp. and *P.* sp. are pathogenic to apple in New Zealand [ibid., xiii, p. 523]. Of 1,290 apples examined in 57 orchards, 40·8 per cent. were affected, and 82·8 per cent. showed open calycine sinuses. It is concluded that mouldy-core is caused by fungi entering the fruit through the open calycine sinus [ibid., xiv, p. 591], which constitutes a varietal defect, enhanced in New Zealand by climatic and environmental conditions. Any of the fungi found can gain entrance and produce mouldy-core.

Smock (R. M.). **Bitter pit of Gravenstein Apples. I. The effect of environmental temperature during the growing period.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 179–186, 1 fig., 1 graph, 1937.

Negative results were obtained in an experiment made to ascertain the effect of environmental temperature during the growth of the fruit on bitter pit of apples [*R.A.M.*, xvi, p. 541]. Boron injections were likewise without effect on the disease [ibid., xvi, p. 262].

Hansen (H. N.), Thomas (Harold E.), & Thomas (H. Earl). **The connexion between Dematophora necatrix and Rosellinia necatrix.**—*Hilgardia*, x, 14, pp. 561–564, 1 pl., 1937.

On four portions of apple roots killed by *Dematophora necatrix* [*R.A.M.*, xiv, p. 176] kept in moist chambers in the laboratory for two years, perithecia were found typical of the genus *Rosellinia* and closely agreeing with *R. necatrix* as studied by Viala and Prillieux. These investigators, however, describe the perithecia as lacking ostioles, but a definite pore is present, though not discernible in old perithecia. Furthermore, the dimensions of the spores, 31·1 to 47·6 by 5·1 to 7·1 μ

(average 37·1 by 6·3 μ), are slightly but not significantly different from those given by Viala and Prillieux. Attempts to germinate the conidia of the fungus were unsuccessful, but 3 per cent. germination of the ascospores was effected by suspending them in 2 c.c. of 5 per cent. lactic acid, adding 10 c.c. of water after the lapse of 15 minutes, pouring the suspension over the surface of potato dextrose agar (3 per cent. agar) in Petri dishes (1 c.c. per dish), and incubating at 22° to 24° C. Single ascospore cultures produced the coremial stage of *D. necatrix* within 24 days, and inoculations with some of these cultures on apple trees successfully reproduced the disease. The genetic relationship of the two stages is therefore established. A species of *Phomopsis* constantly associated with *R. necatrix* is not related to the pathogen.

Shear (J. M.). **Lanolin as a wound dressing for trees.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 286–288, 1937.

The author describes comparative tests on eight Grimes Golden apple trees and an apple tree of unknown origin of the treatment of wounds with lanoline, lanoline-indol acetic acid, and white lead paint. The greatest amount of callus growth was produced on the wounds treated with plain lanoline on which the area of callus tissue after five months was approximately one-fifth more than on the untreated wounds. Most of the beneficial effect was due to the fact that the lanoline prevented the cambium and young callus from drying. Its consistency is such that a film is kept over the growing callus, permitting unimpeded growth. The indol acetic acid was apparently used at too great a concentration (1 to 200) to cause callus stimulation, but with a proper amount of the hormone it should give more growth than plain lanoline.

Overholser (E. L.) & Clore (W. J.). **Six years' records of amount of cork spot fruit on individual d'Anjou Pear trees.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 192–198, 1937.

Six years' observations on the incidence of cork spot on d'Anjou pears in central Washington [*R.A.M.*, xvi, p. 471] showed that serious losses have been caused to pears on *Pyrus serotina* stocks, but that the disease is much less prevalent on pears grown on *P. communis* stocks. Between 1931 and 1936, inclusive, in one orchard studied cork spot was most prevalent in 1931, when the average number of fruits per tree was the second lowest for the period, and least prevalent in 1933, when the average number of fruits per tree was the highest for the period. Individual trees may tend to produce a relatively low or relatively high percentage of corked fruits each year. In comparing the highest and lowest yields of individual trees in relation to cork spot, it was found that when the crop was largest the percentage of cork spot was lower than when the smallest crop was borne, but the lowest crop year did not always coincide with the highest percentage of cork spot. Incidence was higher in the year when the trees made the greatest increase in trunk circumference and produced the largest individual leaves than when the trees made the least increase in girth and in the size of individual leaves. In a fertilizer experiment the trees in nitrogen plots making an annual increase in trunk circumference of 4·5 cm. had an average annual incidence of cork spot of 45 per cent., as against only 24 per cent. for

trees in plots given phosphorus and potassium which had had an average annual increase in trunk circumference of only 3 cm.

WOLLENWEBER (H. W.). **Der schwarze Rindenbrand der Quitte. [Erreger: Phacidiella discolor (Mout. et Sacc.) Potebnia.]** [The black cortical blight of the Quince caused by *Phacidiella discolor* (Mout. et Sacc.) Potebnia.]—*Angew. Bot.*, xix, 2, pp. 131–140, 2 figs., 1937.

Phacidiella discolor, the agent of a black cortical blight of pome fruits [*R.A.M.*, xiv, p. 42], the ascogenous stage of which has hitherto been recorded only on *Pyrus* spp. in the Ukraine and Great Britain, was observed in 1936 on necrotic quince branches at the Biological Institute, Berlin-Dahlem. The spermogonial phase of the fungus, previously known only on *P.* spp. under the names of *Phacidiopycnis malorum*, *Pyrenochaeta furfuracea*, and *Fuckelia conspicua* [ibid., vii, p. 585], was also detected on living and necrotic branches and decayed fruits of quince and apple, and on pears, the latter being invaded mostly through the stem-end.

Pure cultures from the non-septate, ovoid to ellipsoid, hyaline ascospores (averaging 21 by 10 μ) of *Phacidiella discolor* from quince first gave rise to an ephemeral conidial stage with rod-shaped or cylindrical, continuous, hyaline conidia (6·8 by 1·9 μ, 7·5 by 2·5 μ on germination), rarely uniseptate (18 by 4·6 μ), and subsequently to normal *Fuckelia* spermogonia with continuous macro- and micropycnospores (11 by 8 and 5·1 by 2 μ, respectively). A revised Latin diagnosis of the fungus is given, with synonymy.

Both the ascogenous stage of *P. discolor* from quince and the imperfect phase from quince and apple were shown by inoculation experiments to be capable of inducing a black rot of both fruits. The economic significance of the disease, however, does not appear to be considerable.

PROEBSTING (E. L.). **'Kelsey spot' of Plums in California.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 272–274, 1 fig., 1937.

In 1935, plums in the interior valleys of California were widely affected by the high temperature affection known as Kelsey spot [*R.A.M.*, xvi, p. 473]. The condition appeared soon after a hot spell when the fruit was nearly ready for picking. Summer-pruned trees appeared to show less damage than those left unpruned, and no affected fruits were found in another orchard where orchard grass [*Dactylis glomerata*] was growing vigorously. Exposure of the fruit in ovens to 107° F. for 5 hours resulted in no injury, for 15 hours in 10 per cent. damage, and for 72 hours in 60 per cent. These observations confirm Dippenaar's findings and support the view that the trouble is due to heat rather than to drought, 105° F. being about the critical temperature. The evidence indicated that damage due to the condition can be very considerably reduced by summer cover crops.

ADAM (D. B.). **Silver leaf diseases in orchard trees.**—*J. Dep. Agric. S. Aust.*, xl, 9, pp. 693–695, 1 fig., 1937.

Silver leaf (*Stereum purpureum*) of plum trees is stated to be increasing in prevalence in the Adelaide district of South Australia [*R.A.M.*,

x, p. 670; xii, p. 142], and in this connexion a popular account is given of the symptoms of the disease, supplemented by directions for its control. Apricots, apples, and peaches are also affected but show a considerable degree of resistance. Tree lucerne is also reported to suffer from silver leaf in the Mt. Lofty Ranges district, but in general Australian climatic conditions do not appear to be so favourable to the development of the disease as those obtaining in England.

Schäfer (W.). **Beobachtungen über das Auftreten der Kräuselkrankheit (Taphrina deformans) an Pfirsichen.** [Observations on the occurrence of curl disease (*Taphrina deformans*) on Peaches.]—*Z. PflKrankh.*, xlvii, 3, pp. 187–188, 2 figs., 1937.

In recent experiments in a German nursery, only the branches of five-year-old peach seedlings enclosed in bags shortly before the bursting of the buds remained free from leaf curl (*Taphrina deformans*) [*R.A.M.*, xvi, p. 474], and the author concludes that overwintering spores are at least equally instrumental with the mycelium in the production of fresh spring infections. The malformations caused by the fungus are inconsiderable after the leaves reach a fairly advanced stage of development, and the practical advantage of spraying just before the emergence of the shoots is thereby demonstrated.

Wormald (H.). **Bacteriosis of stone fruit trees in Britain. VI. Field observations on bacteriosis of Sweet Cherry trees.**—*J. Pomol.*, xv, 1, pp. 35–48, 4 pl., 1937.

For many years serious losses have been occasioned in cherry orchards in England by young trees dying off and old-established trees losing large limbs. Various types of damage have been observed, all parts except the roots being affected, the symptoms in sweet cherry including stem, crotch, and branch cankers, shoot wilt, bud and spur blight, leaf spots, and occasionally fruit spots. Many isolations were made from the various lesions, and it is stated that the bacteria fell into two groups, one conforming to *Pseudomonas prunicola* [*R.A.M.*, xv, p. 139], and the other to *P. mors-prunorum* [ibid., xv, p. 816]. Successful inoculation experiments with these bacteria are being described in a later publication. The latter organism is stated to be the more generally distributed in Britain, whilst the former is closely related to, and perhaps indistinguishable from, *P. syringae* [ibid., xvi, p. 329] which occurs on the Continent and in North America. Both organisms have been isolated from lesions on stems, branches, shoots, leaf spots, and fruit spots. Observations in commercial plantations showed that among the most susceptible varieties are Black Tartarian, Cluster Black Heart, Bigarreau de Schrecken, Black Eagle, and Bradbourne Black, while Waterloo, Turk, Amber Heart, and Early Rivers are sometimes seriously attacked. Detailed records at Wye during 1936 on over 350 trees of nine varieties showed that Frogmore was the most resistant to cankering, followed in order by Governor Wood, Rounded Heart, Early Rivers, Napoleon, and Waterloo, the first three being also the most resistant to leaf spotting.

The various symptoms observed in cherry trees have much in common with those on the plum. Cankering of the branches is more

frequent than in plums, in which the dying-back of individual branches is exceptional. Gummosis is a conspicuous feature of the cherry disease. Foliage infection is more serious in cherries than in plums, and may be attended with marginal scorching and complete withering of the leaves. In both cherries and plums the sequence of infection is similar; stem lesions develop during the autumn, winter, and early spring, and leaf and shoot infections in spring and summer; the organisms die off in the summer. Control of the disease is being sought along several lines, such as avoidance of pruning in autumn, winter, and early spring when susceptibility is greatest; excision of infected parts early in the year as soon as the lesions can be detected; spraying the branches and stems in the autumn with Bordeaux mixture, some growers obtaining a measure of success by this means; spraying the foliage against leaf spot, which has given some degree of control (but Bordeaux causes injury to certain varieties); and the use of disease-resistant stocks. The work on bacteriosis of cherry in other countries is briefly summarized.

GRUBB (N. H.). **Bacteriosis of Cherry trees: relative susceptibility of varieties at East Malling.**—*J. Pomol.*, xv, 1, pp. 25–34, 1937.

From observations made at East Malling on the susceptibility of 179 varieties of cherries to bacterial canker [*Pseudomonas mors-prunorum* and *P. prunicola*: see preceding abstract] a list is given of the varieties classified in four groups, Lambert, Large and Small Black Mazzard, Royal Duke, Morello, and 35 others being very slightly susceptible, Black Tartarian E, Early Rivers, Archduke, Morello A, and 29 others rather more so, and others considerably or extremely susceptible. Varieties differ in their relative susceptibility to the various types of infection associated with this disease. Root-stocks do not appear to influence the susceptibility of the scion directly (though they may indirectly), and susceptible scions on resistant stocks may be killed while the stock remains uninjured. Local conditions or age of the trees are thought to be responsible for exceptional reactions observed in varieties growing in other orchards.

PASSAVALLI (L. P.). **Difesa preventiva e curativa della Fragola da malattie e insetti nocivi.** [Preventive and curative defence of the Strawberry against diseases and pests.]—*Boll. Soc. tosc. Ortic.*, lxii, 3–4, pp. 55–60, 2 figs., 1937.

Popular notes are given on the occurrence and control in Italy of the following strawberry diseases. *Peronospora potentillae* causes a reddish-brown spotting of the foliage, on the underside of which may be microscopically detected the dichotomously branching conidiophores of the fungus bearing pale violet conidia. The roots are also reported to be affected. Two applications of 1 per cent. Caffaro powder or Bordeaux mixture are generally sufficient to combat the disease. Other foliar disorders are due to *Septoria fragariae* [*R.A.M.*, xiii, p. 110], *Sphaerotheca humuli* [ibid., xv, p. 704], and *Marssonia* [*Marssonina*] *potentillae* [ibid., xiii, p. 9], while the fruits are liable to infection by *Botrytis cinerea* [ibid., xii, p. 102] and *Phytophthora omnivora* [*P.* (?) *cactorum*: ibid., xii, p. 266]. A serious disorder involving desiccation of the shoots and leaves and swelling of the rootlets is caused by a

Micrococcus, which persists in the soil and is responsible for steadily increasing losses unless the infected plants are promptly destroyed.

MITCHELL (R. S.). **Stem end rot of Bananas with special reference to the physiological relationships of Thielaviopsis paradoxa (De Seynes) Von Höhn.**—*J. Coun. sci. industr. Res. Aust.*, x, 2, pp. 123–130, 2 pl. (after p. 168), 1 graph, 1937.

In this study of *Thielaviopsis* [*Ceratostomella*] *paradoxa* isolated from banana stem-end rot [*R.A.M.*, xiv, p. 517; xv, p. 104] in Queensland, the author states that this strain of the fungus (with exospores on the natural substratum measuring 10 to 32 by 5 to 13 μ, and endospores 9 to 23 by 3 to 6 μ) differs slightly in spore size from those described by other workers on other hosts, though these show a considerable range of variation in this respect.

A number of comparative inoculations on banana, pineapple, and sugar-cane, using the strains derived from these three hosts, showed that while the pineapple and sugar-cane strains behave similarly on these two plants, they are only very weakly pathogenic to banana, while the banana strain can attack pineapple only very weakly and sugar-cane not at all. Passage of the banana strain through pineapple, and vice versa, did not affect pathogenicity. These results support the field evidence, which suggests that infection in banana plantations does not originate in diseased pineapples and sugar-cane. The banana disease occurs in winter, the pineapple disease in summer. Temperature studies showed that the optimum and maximum temperatures for growth of the three isolates are: banana strain 24° to 26° C. and 32° to 34°, respectively; both pineapple and sugar-cane strains, 29° to 30° and 34° to 36°, respectively. The author considers that these differences indicate that the Australian banana strain is a biologically distinct one, and suggests for it the name *T. paradoxa musarum* n. var. [without a Latin diagnosis].

K. **Ueber Bodendämpfung—Wirkung, Nutzen und Nachteile.** [On soil steam-sterilization—effect, uses, and drawbacks.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 21, pp. 233–234, 1937.

After briefly reviewing the uses of soil sterilization by steaming in the control of plant pathogens and outlining the methods employed [cf. *R.A.M.*, xvi, p. 548], the writer points out that the process involves the destruction of numbers of beneficial micro-organisms, only bacteria surviving temperatures up to 200° C., and in order to restore the necessary equilibrium among the population within a reasonable period the treated soil should be enriched by the admixture of small amounts of a good, healthy soil.

DIEFFENBACH (E. M.). **Hose coupling for high-pressure spray lines.**—*Agric. Engng, St Joseph, Mich.*, xviii, 5, p. 214, 1937.

A screw coupling without swivel for use with the short high pressure ($\frac{3}{4}$ in.) spray hose now commonly used in spraying from the top of high pressure portable sprayers has been designed and constructed during investigations of orchard spraying by the United States Bureau of Agricultural Engineering, and technical details are here given of its

attachment and installation. The new device is considered to represent a great improvement over the ordinary coupling, the elimination of the swivel increasing strength and capacity while reducing weight, bulk, and expense.

TAYLOR (G. G.). **Application of orchard sprays. III. Spray nozzles (continued).**—*N.Z. J. Agric.*, liv, 2, pp. 71–74; 5, pp. 267–274, 1 fig., 10 graphs, 1937.

Continuing his studies [*R.A.M.*, xvi, pp. 197, 396] on the efficiency of spraying apparatus, the author discusses in detail, and illustrates graphically, the effect of variations in pressure and nozzle design (diameter of disk aperture, and diameter, number, and angle of whorl-plate openings) on the depth of penetration and volume delivery. Depth of penetration was measured by means of a 25 ft. pole, close to the base of which nozzles pointing vertically upwards were fixed, the maximum height of the spray being determined under windless conditions, even a light breeze reducing the carry by 50 per cent. Volume delivery was determined by weighing the water delivered from a nozzle directed into a barrel for 1 minute. As a result of his studies the author tentatively recommends the following standards of nozzle type. For spray rods 4 ft. 6 in. to 6 ft. long, double nozzles with whorl-plates $\frac{1}{8}$ in. thick, $1\frac{3}{16}$ in. in diameter, with 6 openings of $\frac{1}{8}$ in. in diameter, centred on a circle of $\frac{5}{8}$ in. in diameter, and drilled at an angle of 45°; whorl chambers approximately $\frac{1}{8}$ in. deep; disks $1\frac{5}{16}$ in. in diameter and approximately $\frac{3}{64}$ in. thick with apertures $\frac{5}{64}$ in. in diameter for summer and from $\frac{4}{64}$ in. for winter use. For large trees the angle of whorl-plate openings may be reduced to 22·5°, and penetration may be still further increased, if necessary, by using a single nozzle with 6 openings of $\frac{10}{64}$ in. in diameter set at an angle of 22·5°, and with a disk aperture up to $\frac{8}{64}$ in. in diameter. Nozzle pressure should be 250 to 300 lb. For most trees a volume delivery of 3 to 3·5 and 2·25 to 2·75 galls. per minute is sufficient for summer and winter spraying, respectively. This may be somewhat reduced for small trees, or increased to 4 to 4·5 galls. per minute for large ones.

For spray guns, it is desirable that there should be suitable adjustments for rapid and continuous change from wide to narrow angle of cone without sudden change at any point in the adjustment. The required disk sizes must be found by trial, the desirable volume delivery being up to 3·5 and 2·5 galls. per minute for summer and winter use, respectively, corresponding in most cases with $\frac{8}{64}$ in. and $\frac{6}{64}$ in. disks. Nozzle pressure should be 300 to 350 lbs.

These standards of volume delivery are rather higher than those usually employed, and may be found to exceed the capacity of existing pumps. In selecting nozzles, therefore, pump capacity should be considered.

FAJANS (E.) & MARTIN (H.). **The incorporation of direct with protective insecticides and fungicides. II. The effects of spray supplements on the retention and tenacity of protective deposits.**—*J. Pomol.*, xv, 1, pp. 1–24, 1937.

In introductory remarks to these further studies [cf. *R.A.M.*, xv,

p. 382] the authors explain that the quantity of spray residue is determined by the initial amount of protectant retained on the foliage (initial retention) and the capacity of the deposit to withstand weathering (tenacity). In addition, uniformity of deposition (coverage) and suchlike factors influence protective efficiency by their effect on the action of solubilizing agencies (availability) and tenacity.

The amount of initial retention was calculated from the volume of spray necessary to cause incipient run-off, using the atomizer and pendulum method [loc. cit.], there being no preferential retention of the solid phase in the system under investigation. Tenacity was determined by spraying with an amount of suspension not exceeding that required for run-off, and after drying for 24 hours, atomizing with water for 1 minute at 1·5 atmospheres pressure (the pendulum being removed), and determining the copper present colorimetrically after solution in nitric acid.

In experiments with 16 spray supplements the authors found that in most of the systems examined the initial retention is the same as that of the aqueous phase, but in a number the presence of solid reduces initial retention. There was some indication that the addition of solid particles affected the wetting properties of the spray while the effect was also found not to be independent of the nature of the surface sprayed.

The tenacity of a spray deposit was found to be dependent upon the characters of the spray supplement, of the solid particle, and of the surface sprayed. Generally speaking, tenacity is determined by the relative ease of wetting the spray deposit and accordingly is comparatively higher upon surfaces wetted with difficulty; supplements yielding residues insoluble in cold water increase tenacity, whereas those highly surface active, especially at high concentrations, diminish it, and oils, both hydrocarbon and glyceride, enhance it.

The results obtained in field experiments showed that the initial retention, as estimated from the first foliage samplings after spraying, agreed satisfactorily with the estimates made in the laboratory. Similarly laboratory determination of the relative effects of spray supplements on tenacity corresponded with those deduced from field trials (from the amounts of residue in later samplings).

Wilson (J. D.) & Young (H. C.). **Stability of formaldehyde dust prepared with different absorbents.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 185, pp. 53–56, 1937.

In a further test of the keeping quality of formaldehyde dusts [*R.A.M.*, xvi, p. 441], that prepared with kaolin diminished in formaldehyde content after 13 months storage by 1·6 per cent., while the percentage loss with kaolin and infusorial earth was 2·6; sawdust, 3·5; infusorial earth, 4·2; grain hulls (form-o-fume), 6·3; kaolin+trioxymethylene, 7·1; formacide (Hammond Paint and Chemical Co.) 9·3; and muck+kaolin (formo-dust), 13·6. It is concluded that kaolin, infusorial earth, sawdust, and grain hulls are satisfactory absorbents for the preparation of formaldehyde dusts which are to be kept for a prolonged period before use, but that charcoal, muck, marl, and gypsum should not be used unless the dust is to be employed immediately.

Merrill (R. M.). **Water vapor for agricultural spraying.**—*Agric. Engng, St Joseph, Mich.*, xviii, 5, p. 216, 1937.

Water vapour has been used as a carrier for the application of various plant protectives in preliminary experiments during the last two years at the Ohio Agricultural Experiment Station. The vapour generator used in the tests was a commercial machine designed for cleaning purposes, with a flash boiler as the generator unit and a pressure atomizing fuel oil burner for heat, and the apparatus was modified so that the fungicide was pumped from an auxiliary tank into the vapour delivery line. The spraying preparations used included lime-sulphur, wettable sulphur, Bordeaux mixture, and copper oxychloride. Effective treatments were made on apple against scab [*Venturia inaequalis*] and cherry against leaf spot [*Coccomyces hiemalis*: *R.A.M.*, xv, p. 2] with about one-third to one-fourth of the material ordinarily used with standard appliances.

Boutaric (A.). **La mouillabilité des bouillies. Conditions à remplir par un mouillant.** [The wettability of spraying mixtures. Conditions required from a wetter.]—*Rev. Vitic., Paris*, lxxxv, 2233, pp. 263–265, 1937.

After referring to the various substances that from time to time have been suggested for use as wetters or spreaders for plant protective sprays, the author states that the time factor involved in Héranger's first definition of 'mouillance' [*R.A.M.*, xiv, p. 556; xvi, p. 331] is not usually taken into consideration in the conception of the 'wettability' of a liquid, which, in his opinion, could be better defined in inverse terms of the thickness of the liquid film formed by the spray fluid over a unit of area. Héranger's statement that 'lowering the surface tension of a liquid also lowers its viscosity' was not borne out by experiment, for the author and his collaborators found that the addition to a fluid of a substance which reduces surface tension usually increases the viscosity of the liquid.

Coons (G. H.). **Progress in plant pathology: control of disease by resistant varieties.**—*Phytopathology*, xxvii, 5, pp. 622–632, 1 graph, 1937.

This is an interesting and suggestive review of recent developments, illustrated by some outstanding instances [reference to which has been made from time to time in this *Review*] in the breeding of disease-resistant varieties of economic plants [*R.A.M.*, xvi, p. 549]. From an analysis of the relevant statistical data the writer concludes that the cultivation of such varieties adds at least $60,000,000 to $70,000,000 per annum to the farm wealth of the United States and indirectly benefits the national resources by a much higher figure—probably double.

Sigriansky (A. M.). Справочник агронома по борьбе с болезнями сельскохозяйственных растений. [The agronomist's manual on the control of diseases of agricultural plants.]—615 pp., 510 figs., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Moscow, 1936. [Received April, 1937.]

This semi-popular manual, compiled by a group of specialists under

the general editorship of Sigriansky, deals with practically all the diseases of bacterial, fungal, or virus origin known to occur on the territory of the U.S.S.R. on agricultural, industrial, and pharmaceutical plants, both in the field and in storage. Separate chapters are given to a technical discussion of the more common fungicides, and to an account of the apparatus for seed and soil disinfection, and a nine-page Russian bibliography is appended.

Naoumoff (N. A.). Методы микологических и фитопатологических исследований. [Methods of mycological and phytopathological investigations.]—272 pp., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Leningrad, 1937.

After briefly indicating in an introductory chapter the purposes, significance, and limitations of the study of micro-organisms in culture, the author gives a detailed description of the latest cultural technique developed in the U.S.S.R. and other countries. The main body of the book is divided into two parts, the first of which deals with the isolation and cultivation of fungi, both pure saprophytes and those pathogenic to plants, man, and animals, a special chapter being given to the preparation of media, and the second part with the study of the obligate parasites on the host plants under experimental conditions. In both parts special methods applicable to individual fungi or allied species are discussed separately under their respective orders. An extensive bibliography is appended to each section of the book, which is supplied with an index of the organisms dealt with.

Gutner (L. S.), Dobrozrakova (Mme T. L.), Letoff (A. S.), & Stepanoff (K. M.). Определитель болезней растений по внешним признакам. [Key to plant diseases by their external symptoms.]—287 pp., 58 pl., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Leningrad, 1937.

This is a collection of dichotomous keys for the determination by their macroscopic symptoms of 1,863 parasitic (fungal, bacterial, and virus) and functional diseases of 134 crop plants cultivated in the U.S.S.R. [cf. *R.A.M.*, xii, p. 306], including a few not yet known in that country and the exclusion of which is attempted by quarantine measures.

Reports on the work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom 1934–1935. —338 pp., H.M. Stationery Office, 1937.

This report, prepared on similar lines to those of previous years [*R.A.M.*, xv, p. 342], comprises summaries of the work in progress at the various British research stations and advisory centres throughout the United Kingdom.

Renn (C. E.). **The Eel-Grass situation along the middle Atlantic Coast.** —*Ecology*, xviii, 2, pp. 323–325, 1937.

During the five years that have elapsed since the appearance of the wasting disease of *Zostera marina* along the American Atlantic coast [*R.A.M.*, xvi, p. 113] the reports received have indicated a progressive

increase in the number of new beds and an extension of refoliated range. The plant persists in profusion through the summer only in a few areas; usually the *Labyrinthula*-infected leaves slough off early in the season, leaving sparsely developed stems, but in certain localities thick grass has abounded in spite of heavy infection. During warm weather the parasite is very active and may destroy the plants within a few days of the appearance of spotting or streaking. The results of a survey early in June, 1936 [loc. cit.] are given in detail; in the course of this it was observed that seedlings were uncommon in the foliated areas, indicating that growth occurs chiefly from persistent stem stock. It is expected that long, cool springs will accelerate the spread of the beds, while rapid warming of the water will shorten vegetative development and favour infection.

Brenchley (Winifred E.). **Some deficiency diseases of crop plants.**—*J. Minist. Agric.*, xliv, 2, pp. 116–122, 1937.

In this popular article examples of boron, manganese, copper, and zinc deficiency diseases are given, and their investigation and control reviewed. The author suggests that the probably increasing prevalence of diseases of this type may be due to exhaustion caused by the growing practice of replacing organic manures, containing a wide variety of elements, by artificials, the improving purity of which tends still further to exclude traces of the relevant essential substances. Special applications to correct deficiencies should be made with caution, since in excess they are toxic; and for this reason it is considered to be inadvisable to incorporate borax, manganese sulphate, and the like in compound fertilizers intended for general use.

Chester (K. S.). **A critique of plant serology. Part I. The nature and utilization of phytoserological procedures.**—*Quart. Rev. Biol.*, xii, 1, pp. 19–46, 1937.

Following a brief introductory survey explaining the nature of serology and defining the scope of his studies on the subject, the author critically discusses the following aspects of the theme: preparation of plant antigens and immune sera, precipitation, anaphylactic, lytic, and agglutination reactions, acquired resistance to plant pathogens and toxins, and other serological tests with plant antigens [*R.A.M.*, xvi, p. 66, and below, p. 700].

Isakova (Mme A. A.) & Smirnova (Mme A.). **The influence of various microbe complexes of bacteriorhizas on the development of higher plants.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xiv, 6, pp. 397–398, 1937.

In continuation of the investigations described in a recent communication by the first-named author [*R.A.M.*, xvi, p. 334], a summarized account is given of experiments on the effect of suspensions, introduced under the seeds at planting, of bacterial complexes (bacteriorrhiza), obtained by washing the roots of buckwheat, mustard, lupins, wheat, or isolated from soil mixtures, on the germination and development of wheat and mustard. In the treated pots the germination of the seed of both plants was completed by the fifth day, whereas in the control pots it was only completed by the ninth day. While all the bacteriorrhiza

tested had an accelerating and stimulating effect on the development of wheat, the lupin complex was the most active in advancing (by eight days) the flowering stage, and that of mustard in stimulating the growth in height of the host, the stalk of the treated plants attaining 47·5 cm. in height, as against 31·5 for the controls, at the flowering stage. The mustard, soil mixture, and lupin complexes also increased the grain to straw ratio from 0·35 in the controls, to 0·65, 0·60, and 0·50 for the treated plants, respectively. The lupin and soil mixture complexes accelerated the flower bud stage of mustard by 10 days, wheat bacteriorrhiza by 6 or 7 days, while that of buckwheat was without effect. These results are considered to show that the influence of various bacterial complexes is specific as regard different plants, and that there is no uniformity in their action.

Sprau (F.). **Beiträge zur Mykorrhizenfrage. Die Fruktifikation eines aus Orchis masculus isolierten Wurzelpilzes, Corticium masculi nov. spec.** [Contributions to the mycorrhiza problem. The fructification of a root fungus isolated from *Orchis masculus*, *Corticium masculi* nov. spec.]—*Jb. wiss. Bot.*, lviii, 2, pp. 151–168, 7 figs., 1937.

Clamp-connexions were formed in pure culture by a fungus isolated from *Orchis masculus* roots in the Rhön mountains (Bavaria), followed six weeks later by the development of clavate to sub-cylindrical basidia, with a maximum width of 4·5 to 5·6 μ, 5 to 8 (generally 6 or 7) awl-shaped sterigmata, slightly curved outwards, 3·5 to 3·8 μ long by 1·5 to 1·8 μ at the site of insertion, and thin-walled, smooth, oval, or very slightly reniform, hyaline spores, 3·5 to 4·2 by 2·4 to 3 μ. Single spore cultures yielded mycelium with clamp-connexions, and the fungus is therefore evidently homothallic. A similar isolation from Geisenheim (Rhine) did not form clamp-connexions and remained sterile. In 1 per cent. starch agar cultures and on *Polypodium* roots the fungus forms monilioid elements and sclerotia; it induces the germination of *O. masculus* seeds and is able to live in symbiosis with the plant. It is related to *Corticium varians* and *C.* (*Hypochnus*) *catonii* [*R.A.M.*, xv, pp. 41, 243], but does not agree completely with either species and is accordingly named *C. masculi* n. sp. [without a Latin diagnosis]. A close relationship with the *Rhizoctonia* spp. associated with indigenous soil orchids [cf. ibid., xvi, p. 466] is further indicated by the capacity of *C. masculi* for stimulating seed germination and entering into a symbiotic partnership with its host.

Fraser (Lilian). **The distribution of sooty-mould fungi and its relation to certain aspects of their physiology.**—*Proc. Linn. Soc. N.S.W.*, lxii, 1–2, pp. 35–56, 1 pl., 1 fig., 7 graphs, 1937.

The author records observations in nature and numerous cultural experiments which indicate that the factors determining distribution of sooty mould colonies [*R.A.M.*, xv, p. 530] are mainly the comparative resistance to heat and desiccation of these fungi, which are able to grow slowly only during humid periods, while in culture it was found that the composition of the medium may modify the degree of such resistance. Though a considerable degree of dry heat is tolerated, the moulds

are very susceptible to moist heat. In some cases they are restricted to the excretions of specific insects, to the distribution of which they are thus limited.

With some exceptions, species of sooty mould fungi do not exercise an appreciable staling effect on one another. Their secretions do, however, strongly retard the growth of *Penicillium*, and it is suggested that the low incidence of common saprophytes on honey-dew may be due to this cause, to their susceptibility to exposure to heat and desiccation, and to the fact that adonite, the chief constituent of the honey-dew of *Ceroplastes destructor* is not specially suitable for their growth, though it is very suitable for sooty moulds. During wet periods, when most of these conditions are mitigated, *Penicillium*, *Alternaria*, *Fusarium*, and other fungi occur more abundantly in sooty mould colonies.

It appears that the habitat of the sooty mould-forming fungi is determined by their slow rate of growth, their ability to make use of slight and intermittent supplies of water, their resistance to heat and dryness, and the suitability of honey-dew as a medium. The fact that they are usually found fruiting may be due to the stimulating effect on sporulation of the secretions of other species with which they are usually associated, and probably also to the ultra-violet radiation of sunlight to which they are exposed.

Edwards (H. I.) & Newton (W.). **The physiology of Rhizoctonia solani Kühn. V. The activity of certain enzymes of Rhizoctonia solani Kühn.**—*Sci. Agric.*, xvii, 5, pp. 544–549, 1937. [French summary.]

A number of strains of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvi, p. 338] obtained from different hosts were morphologically identical in culture, and in an attempt made by the authors to devise a biochemical method of differentiating them it was found that they could be distinguished by their enzyme activities.

A study of the invertase activity indicated that three strains isolated from wheat were distinct, and that therefore several physiological forms may attack the same host species; while on the other hand strains from aster [*Callistephus chinensis*] and potato were similar. Invertase activity alone is not an adequate indicator, however, and that of other enzymes was investigated in the hope of developing a more satisfactory technique by observing the effect of various nitrogen compounds in the nutrient media. When peptone was the sole source of nitrogen, enzyme activity was high, possibly owing to the protection of the enzymes against hydrolysis, and was not increased by the addition of nitrate and ammonium salts; while it was low in media containing gelatine, potassium nitrate, ammonium sulphate, or urea.

Frémont (Thérèse). **Extension de techniques employées en pathologie animale à l'étude des réactions de la cellule végétale à certaines infections.** [An extension of the technical methods employed in animal pathology to the study of the reactions of plant cells to certain infections.]—*Ann. Inst. Pasteur*, lviii, 5, pp. 531–589, 3 diags., 1937.

By an adaptation of the serological technique commonly applied in studies of animal immunology, the writer investigated the reactions of

bean (*Phaseolus vulgaris* and *Vicia faba*), onion, and potato tissues to inoculation with various bacteria, e.g. *Bacillus proteus* [*Bacterium proteus-vulgaris*], *B. gärtneri* [*Salmonella enteritidis*], and *B.* [*Bact.*] *coli*, not normally pathogenic to these plants. The colour, density, stability, acidity, and other properties of the extracts of inoculated plants were found to differ widely from those of healthy ones, and the results of inoculation experiments on animals clearly demonstrated the formation by the infected plants of antigens capable of modifying the virulence of the organism. It is concluded on the basis of these experiments that far-reaching analogies exist between animal and plant cells in respect of acquired immunity from infectious diseases [*R.A.M.*, xv, p. 678, and above, p. 698].

McKay (R.). **Potassium permanganate as an aid to the production of asexual fructifications by Phytophthora erythroseptica Pethybr.**—*Nature, Lond.*, cxxxix, 3523, p. 802, 1937.

The author states that the production of zoosporangia in six- to twelve-month-old cultures of *Phytophthora erythroseptica* [*R.A.M.*, xiii, p. 531] can be stimulated by the addition of a little permanganate solution to the transfer water, the procedure recommended being to place portions of the medium (ground Quaker oats agar) in which the fungus is cultivated in drops of tap water on glass slides laid on white paper, and to add a 0·01 to 0·02 per cent. permanganate solution until a faint pink colour is just discernible. A cover slip is then placed over the preparation, which is incubated in a moist chamber at 16° to 20° C. The production of the fructifications reaches its maximum in 84 to 86 hours.

Bredemann (G.) & Radeloff (H.). **Über Fluor-Rauchschäden. Fluoraufnahme durch die Rinde der Sprosse und ihre Wirkung.** [On fluorine smoke injury. Fluorine assimilation by the cortex of shoots and its action.]—*Angew. Bot.*, xix, 2, pp. 172–181, 1937.

Microchemical analyses of the fluorine assimilation of certain fruit trees, hardwoods, vegetables, and ornamentals at the Hamburg Institute of Applied Botany showed that both summer and winter exposures to the gas lead to the accumulation of large quantities, both in water-soluble and insoluble form, in the cortex and occasionally also in the xylem. From the standpoint of assessing practical damage from factory emanations and the like [*R.A.M.*, xv, p. 267], it should be noted that twig and shoot development is not appreciably impaired by the accumulation of fluorine compounds in the cortex, though desiccation may result from excessive or protracted absorption. The fluorine does not persist in the newly-formed shoots of trees, herbaceous plants, or bulbs transferred to a smokeless atmosphere, so that the presence of the gas in these organs necessarily connotes re-exposure to toxic exhalations.

Whitehead (T.). **Virus diseases of the Potato. The 'carrier' problem. Its relation to symptomatology and commercial Potato growing.**—*Ann. appl. Biol.*, xxiv, 2, pp. 323–341, 1 pl., 1937.

In this critical review of the results achieved in the study of 'carriers' of potato viruses the author points out that no fundamental difference exists between carrying and masking, though the former is regarded as

a permanent, and the latter merely a temporary phenomenon. The plant cell is the symptomatological unit and discontinuous symptoms are interpreted as implying localized impotence in tissues surrounded by others in which the host protoplasm is dominant. Atypical reactions of carrier varieties need to be taken into account in segregating viruses. The plant can modify the virulence of a virus or even apparently destroy it, the tissues traversed by the virus becoming virus-free or the virus-infected plant recovering, with the complete elimination of the virus. The full range of symptoms possible in a plant require to be determined in virus segregation and diagnosis and not merely the average symptoms obtained under the particular conditions favoured by each worker. Examples of the breakdown of carrying power are cited and this factor discussed in relation to the description of new viruses. The permanent masking of symptoms until the plant reaches maturity represents the converse of such breakdown. No diminution of vigour or cropping power has been observed in carrier plants, in fact a carrier may exhibit reduced susceptibility to certain of the viruses present in the field.

Field trials on the transmission of the carried viruses paracrinkle (Bawden's E) in King Edward VII potatoes and virus X and streak [*R.A.M.*, xvi, p. 337] in Up-to-Date to Arran Victory, Great Scot, and Majestic, mostly intolerant to these viruses, showed that neither virus was transmitted to the latter varieties when growing in rows adjacent to either of the two former. These carrier varieties, therefore, do not constitute the serious menace to other susceptible varieties as is commonly suspected.

KÖHLER (E.). **Ueber ein 'Veinbanding-Virus' der Kartoffel.** [On a 'veinbanding virus' of the Potato.]—*Phytopath. Z.*, x, 1, pp. 17–29, 7 figs., 1937.

Continuing his studies on the 'P' virus of potatoes [*R.A.M.*, xv, p. 391], the writer observed that field plants of the Direktor Johanssen and Industrie varieties, from which the virus was transmissible in a pure state to Samson tobacco, showed extensive mottling and leaf curl, which disappeared in the height of summer in a similar manner to 'Yr' (a weak variant of Y) detected some years ago in an east German selection. The symptoms in the Y-susceptible Goldfink variety were much less conspicuous, while in Erdgold they were barely perceptible. The same relationships, in an intensified form, were observed on greenhouse plants.

The indeterminate symptoms induced by the 'P' virus on Samson tobacco [loc. cit.] are readily distinguishable from those caused by Y or by mixed infections with X+P and X+Y. On White Burley, 'P' produces the well-marked veinbanding described by Phyllis Clinch and Loughnane for their A virus [ibid., xvi, pp. 116, 117]. On *Nicotiana alata*, which contracts a severe spotting on inoculation with Y, the 'P' virus remains latent. In [illegible]ed inoculations on tobacco leaves with 'P' and various strains of the potato ring spot and mottle types of the X virus [ibid., xvi, p. 550], the influence of the former was apparent in distinct aberrations from the ordinary symptoms. No protective action against Y was conferred on White Burley tobacco by previous inoculation with 'P'.

Positive results were given by experiments in the transmission of 'P' from Erdgold potato foliage to potato sprouts by means of *Myzus persicae*, whereas attempts to convey it by the same means from tobacco to tobacco were unsuccessful.

The results of these studies are considered to establish the identity of 'P' with A [see next abstract], 'Yr', and Koch and Johnson's 'vein-banding virus' [ibid., xiv, p. 524], and it is suggested that 'A' be adopted as a convenient international symbol of the infective principle concerned. The close relationship of A with Y is indisputable, and possibly both may be regarded as more or less stable, interchangeable variants of one and the same virus.

KÖHLER (E.). **Zur Frage der Schutzimpfung bei den Veinbanding-Viren. (Vorläufige Mitteilung.)** [On the question of protective inoculation in the veinbanding viruses. (Preliminary note.)]—*NachrBl. dtsch. PflSchDienst*, xvii, 4, pp. 32–33, 1937.

In the course of further studies on the 'P' virus [see preceding abstract], the writer found that one of the veinbanding strains (2A) of this relatively mild group differed from the forms of 'P' hitherto encountered in the production of somewhat more acute symptoms (though not nearly as intense as those due to the Y virus proper) and conspicuous interveinal spotting both on Samson and White Burley tobacco. Neither 2A nor the two 'P' forms tested (716/17 and 716/12) were capable of conferring a reciprocally protective action on tobacco against subsequent inoculation, thereby excluding the possibility of relationship. There are thus apparently two weak veinbanding virus groups, of which 2A, like Salaman's strain [see next abstract], is a feeble variant of Y, while the 'P' forms (identical with A) represent an entirely unrelated principle.

SALAMAN (R. N.). **Acquired immunity against the 'Y' Potato virus.**—*Nature, Lond.*, cxxxix, 3526, pp. 924–925, 2 figs., 1937.

Sap inoculations from witches' broom-like outgrowths at the base of otherwise healthy *Schizanthus retusus* plants to tobacco resulted in a dull vein-clearing, followed by a faint mottle and inconspicuous veinbanding on the older leaves, all of which are characteristic of the Y virus [see preceding and next abstracts] in an attenuated form. Passage through its own host induced a further considerable weakening of the virus, as judged by its reaction on tobacco. The new strain exerted an immunizing effect on tobacco against further infection by the normal Y virus [*R.A.M.*, xvi, p. 483] but was insufficiently attenuated to confer a similar protective action on potatoes [ibid., xvi, p. 630]; a further reduction of its potency was effected by placing tobacco root fibres infected with both weak and strong forms of the virus in Erlenmeyer flasks containing nutrient fluid under sterile conditions at 22°, 35°, and 40° C. After about a week the virus extracted from the cultures showed sufficient attenuation to afford complete and partial protection, respectively, to tobacco and potato (President and Up-to-Date); nearly 100 weak strains were secured by this method. Slightly better results were obtained at the higher temperature ranges, but there was little or no difference between the strains originating from strong or weak infections.

The author concludes that the possibility of inducing immunity from one of the worst potato viruses is brought appreciably nearer by this work. The witches' brooms on *S. retusus* are stated not to be due to the weak Y virus.

BÄRNER (J.). **'Intrazellulare Stäbe' bei viruskranken Tabak- und Kartoffelpflanzen.** ['Intracellular cordons' in virus-diseased Tobacco and Potato plants.]—*NachrBl. disch. PflSchDienst*, xvii, 4, pp. 33–34, 1 fig., 1937.

The writer detected the presence of 'intracellular cordons', similar to those associated with vine 'reisig' disease [*R.A.M.*, xvi, pp. 231, 622] in potato and White Burley tobacco plants infected by the Y virus [see preceding abstracts]. In phloroglucin-hydrochloric acid xylem preparations the 'cordons', which measure up to 56 by 3·8 μ, remain colourless in contrast to the vivid red of the tracheal walls. The occurrence of these elements in the tissues is interpreted, by analogy with their significance in relation to vine 'reisig' disease, as representing an early stage of virus infection.

KÖHLER (E.). **Fortgeführte Untersuchungen mit verschiedenen Stämmen des X-Virus der Kartoffel (Ringmosaikvirus).** [Continued investigations on various strains of the X virus of the Potato (ring mosaic virus).]—*Phytopath. Z.*, x, 1, pp. 31–41, 4 figs., 1937.

The two groups into which the various constant types of potato ring mosaic with specific properties previously described [*R.A.M.*, xv, p. 390] have been found to fall are designated X_I and X_{II}, the former containing Ers virus and its strains 25 and 34 and probably Koch's potato mottle [ibid., xiv, p. 523], and the latter M 23, H 19 and its weaker variants Mb 12 and E_1, Cs, probably Koch's potato ring spot virus [loc. cit.], and Bawden's X, D, and B viruses [ibid., xvi, p. 53]. The representatives of X_I differ from those of X_{II} not only in their symptomatology and greater thermostability, but also (and most significantly) in the absence of any mutually protective action between members of the two groups, that is to say, plant organs permeated by a virus of X_I are immune from subsequent infection by one of the same group but not by an X_{II} virus.

In addition to the information already presented on the Ers and Cs viruses [ibid., xv, p. 391], it is here stated that Ers 25 differs from all other known X strains in the initial production on Samson tobacco leaves of expanding, chlorotic, circular lesions instead of rings, a similar manifestation being observed also on *Nicotiana alata* and other *N.* spp. The virus is readily transmissible to *Datura stramonium*. The incubation period of the weak strain Ers 34 was about double the normal. Besides the 'normal' Cs A (tortoise-shell) strain, a much stronger variant (Cs 35), producing severe and persistent necrosis of tobacco foliage, was differentiated. Mixed inoculations with Ers 25 and Cs A on tobacco plants led to the development of a peculiar blend of symptoms and to arrested growth, thereby confirming the absence of close affinity between the two strains, since combined inoculations with nearly related X viruses ordinarily tend either to the development of indefinite pathological phenomena or to the predominance of one partner over the other.

HANSEN (H. P.) **Spredningsbetingelser for Kartoffelens Virussygdomme i Forhold til praktisk Kartoffelfremavl.** [Conditions of spread of Potato virus diseases in relation to practical Potato propagation.] —Reprinted from *Ugeskr. Landm.*, *1937*, 4 pp., 1937.

The only potato viruses observed by the writer in Denmark are X, Y, A [see preceding abstracts] and leaf roll; giant hill [*R.A.M.*, xv, p. 460] also occurs, but this disorder is not definitely known to be due to a virus. In connexion with some outstanding recent contributions to the knowledge of the transmission of potato viruses by aphids, a scheme is propounded for the production of virus-free seed potatoes on island farms, whence the tubers would be sent for propagation to suitable mainland stations, selected for their humid, cool, and windy climate, absence of crucifers on which the aphids overwinter, and isolation from infected areas [ibid., xvi, pp. 52, 551].

WARTENBERG (H.). **Ueber die Pufferung der Preßsäfte abbaukranker und gesunder Knollen der Kartoffel.** [On the buffering of the expressed juices of degeneration-diseased and sound Potato tubers.]—*Phytopath. Z.*, x, 1, pp. 43–56, 4 graphs, 1937.

Analyses by the electrometric method of the expressed juices of 'degenerate' and sound potato (Erstling [Duke of York], Parnassia, and Paul Krüger [President]) plants showed that buffering was stronger in the former than in the latter [*R.A.M.*, xvi, p. 486]. The phenomenon was most pronounced in the leaves and least in the stems, the tubers being intermediate in this respect. The expressed juices of tobacco plants artificially inoculated with the X and Y viruses [see preceding abstracts] did not differ from those of healthy material, whereas in the case of a mixed X+Y infection buffering was much stronger in the diseased than in healthy juices. These observations, while individually accurate, do not at present throw any light on the etiology or course of degeneration, nor are sufficient statistical data available at the present stage to form a judgment of general validity on the relationship (if any) between the extent of buffering in the juice and the state of health of the potato.

RAMSHORN (K.). **Zur Physiologie des sog. Kartoffelabbaues. II. Über eine formative Wirkung von Heteroauxin auf das Austreiben von Kartoffelknollen.** [On the physiology of the so-called Potato degeneration. II. On a formative action of heteroauxin on the germination of Potato tubers.]—*Planta*, xxvi, 5, pp. 737–750, 4 figs., 1937.

Having observed that the progeny of 'degenerate' potatoes [see preceding abstract] showed an annually increasing tendency to germinate by means of numerous long, thin shoots distributed at random over the tuber, instead of by the normal method of short, vigorous shoots at the apical end, the writer carried out a series of experiments on the Erdgold, Odenwälder Blaue, and Wekaragis varieties to determine the possible relationship of this phenomenon to the problem of deterioration as a whole.

The decapitation of all buds except the terminal one failed to induce normal polarization of germination, and the effect of the application of **hetero**auxin (indolyl acetic acid in a lanoline paste) [see above, p. 689]

to the tubers was accordingly tested, the substance being introduced through slits in the apical end before planting out in the spring of 1935. In the case of Erdgold there was no immediate increase of yield in comparison with the controls, but the tubers from the treated plants germinated normally and the 1936 crop developed satisfactorily and gave rise to offspring showing the normal type of germination at the end of the winter 1936–7. The controls (receiving lanoline paste alone) made poor growth and germinated abnormally as described above. Odenwälder Blaue and Wekaragis tubers reacted during the first season after treatment by increased yields.

The treatment of the tubers with heteroauxin before the inception of germination induces characteristic reactions. Direct application almost invariably retards the development of the 'eyes' in healthy tubers, while this response is less frequent in diseased material. The disturbance of polarity in the germination of 'degenerate' tubers is attributed to auxin deficiency in relation to other physiological components, and the possibility arises that the whole essence of deterioration may reside in an insufficiency of growth-promoting elements curable by heteroauxin treatment on the lines herein indicated.

JAHNEL (H.). **Wuchsstoffuntersuchungen an abbaukranken Kartoffeln.** [Auxin investigations on degenerate Potatoes.]—*Phytopath. Z.*, x, 1, pp. 113–117, 1 graph, 1937.

The emulsion of young 'degenerate' Direktor Johanssen, Odenwälder Blaue, and Parnassia potato tubers yielded 30 per cent. less auxins than that of sound material, and the leaf spindles of diseased plants required a higher heteroauxin [see preceding abstract] concentration to produce normal curving than those of healthy ones. A disturbance in the hormone metabolism of degenerate plants would thus appear to be indicated.

WARTENBERG (H.) & KLINKOWSKI (M.). **Eine 'Jodprobe' zur Pflanzgutwertbestimmung der Kartoffel. Vorläufige Mitteilung aus Untersuchungen.** [An 'iodine test' of the value of Potatoes for seed. Preliminary note on the investigations.]—*Phytopath. Z.*, x, 1, pp. 107–109, 1937.

In preliminary experiments the 'iodine test' of the value of potatoes for seed was applied as follows. Equal quantities of expressed 'degenerate' [see preceding abstract] and healthy tuber juice and starch solution are mixed in a test tube with a uniform amount of iodine; after a certain time (one hour if small quantities of iodine are used, longer for larger amounts) the entire contents of the tube turn blue-black in the case of the healthy material, whereas in that of the diseased only the sediment at or near the bottom is discoloured. The most suitable proportions of juice, starch, and iodine for this purpose have not yet been calculated.

TOPEKHA (Mme E. F.). **Biochemie der Viruserkrankungen von Kartoffeln.** [Biochemistry of Potato virus diseases.]—*Bull. appl. Bot. Select.*, xiv, pp. 53–67, 1936. [Russian, with English summary. Abs. in *Ber. wiss. Biol.*, xliii, 3–4, p. 216, 1937.]

In comparative biochemical tests (forming part of a systematic study on the physiology, biochemistry, and anatomy of plants in the U.S.S.R.)

on potato tubers from sound plants and from those affected by leaf roll, mosaic, and other virus diseases [see preceding abstracts], the most striking difference between the two lots was in the dehydrase activity of the juice extracts, those of diseased tubers much more rapidly decolorizing a methylene blue solution than those of healthy ones [*R.A.M.*, xv, p. 822], irrespective of the duration of the resting period. Generally speaking, peroxidase and catalase activity is more intense in diseased than in sound tubers, though in respect of the former there is no difference between the two lots by the close of the resting period. Diseased tubers contain larger amounts of albumin nitrogen than healthy ones, evidently in consequence of the relative inactivity of the proteolytic ferments in the former. There is no change in the ascorbic acid content of diseased tubers [cf. ibid., xiv, p. 785 *et passim*].

Köhler (E.). **Versuche über Pfropfung und Akronekrose bei Kartoffeln. Vorläufige Mitteilung.** [Experiments on grafting and acronecrosis in Potatoes. Preliminary note.]—*Angew. Bot.*, xix, 2, pp. 158–160, 1937.

The writer records the development of severe acronecrosis [*R.A.M.*, xvi, pp. 53, 480] on grafts of Spätrot (virus-free) on Duke of York potatoes (carrying virus X) and of mild symptoms of the same disorder in the reciprocal combination. In the latter case the toxins produced in the stock by the action of the virus apparently permeate the scion and cause mild injury, while in the former the severe symptoms are primarily due to the toxic substance formed under the influence of the virus, and only secondarily, or not at all, to the virus itself. A somewhat analogous phenomenon was observed in grafts of the susceptible Wohltmann on the semi-immune Ackersegen and vice versa, but in other cases, e.g., Duke of York on Silesia (virus-free) and reciprocally, toxin formation was evidently absent. There is reason to believe that the toxin partially immobilizes or destroys the virus itself in the plant tissues.

Novotelnova (Mme N. S.). Влияние температуры и влажности на прорастание конидий **Phytophthora infestans (Mont.) de Bary.** [Influence of temperature and humidity on the germination of the conidia of *Phytophthora infestans* (Mont.) de Bary.]—*Pl. Prot., Leningr., 1937*, 12, pp. 79–88, 2 figs., 1 graph, 1937. [English summary.]

In studies on the germination of conidia of *Phytophthora infestans* [*R.A.M.*, xiii, p. 724; xv, p. 45], the author found that direct germination (by germ-tubes) occurred within a temperature range of 4° to 30° C., indirect germination (by zoospores) between 6° to 21° only, and combined germination (in which the germ-tube originally formed is transformed into a secondary conidium, germinating directly or indirectly) between 24° and 30°. The optimum temperature was 25° for direct, 10° to 15° for indirect, and 24° to 28° for combined germination. The conidia withstood four hours at 35° and 48 hours at 1° to 2°, but under dry conditions they rapidly lost their viability (within 30 mins.). The appearance of *P. infestans* in epidemic form is correlated with rain or dew combined with comparatively low temperatures, conditions which promote the germination of zoospores.

Taylor (C. F.) & Blodgett (F. M.). **Control of a wilt disease of Potato by formaldehyde dust.**—*Amer. Potato J.*, xiv, 5, pp. 154–157, 1937.

A wilt disease closely resembling that caused by *Fusarium* [*solani* var.] *eumartii* [*R.A.M.*, xvi, p. 489] is stated to have spread alarmingly among the western New York potato crops during the last few seasons. The first symptom on Rurals is a bronzing of the leaflets just below the apex of the stem, followed by an increasingly severe, frequently unilateral, yellowing and necrosis. Brown necrotic areas, usually larger and darker than those associated with yellow dwarf [ibid., xvi, p. 56], develop in the pith of the stem, especially at the nodes. The mature tubers show a dark brown discoloration of the vascular system, often surrounded by a water-soaked zone. The disease, locally known as 'Z', was occasionally present in fields used during the past three years for scab [*Actinomyces scabies*] control experiments, in the course of which it was observed that the former was much reduced by 8 per cent. formaldehyde dust (1 lb. commercial formalin to 4 lb. uncalcined celite, 3 oz. per bush. of seed pieces). The treatment, however, must be followed by immediate planting if heavy decreases in stand and yield are to be obviated.

Stapp (C.). **Weitere Beiträge zur Frage der Widerstandsfähigkeit verschiedener Kartoffelsorten gegen Schwarzbeinigkeit und Knollennassfäule, verursacht durch Bacterium phytophthorum Appel.** [Further contributions to the question of the resistance of different Potato varieties to blackleg and tuber wet rot caused by *Bacterium phytophthorum* Appel.]—*Angew. Bot.*, xix, 2, pp. 141–152, 1937.

Continuing his studies on the varietal resistance of potatoes to blackleg and tuber wet rot caused by *Bacterium phytophthorum* [formerly *Bacillus phytophthorus*: *R.A.M.*, xiv, p. 525], the writer found that only one of the 25 officially recognized varieties tested for this purpose was highly resistant, viz., Sickingen, though Frühe Hörnchen is probably also only slightly susceptible. High and extremely high degrees of susceptibility were shown, respectively, by five (including Parnassia, Starchy I, and Wekaragis) and twelve (including Kaiserkrone, Frühmölle, Edelragis, Altgold, and Rote Mäuse) varieties, eleven of those in the latter group being yellow-fleshed as were also seven out of the eight most susceptible varieties in the earlier investigations, so that a correlation may be presumed to exist between this character and liability to blackleg. No definite connexion could be traced, on the other hand, between susceptibility to *Bact. phytophthorum* and time of maturity, skin texture, capacity for wound periderm formation, or rapidity of dissolution of the parenchyma tissue of the tubers. Of the two strains (14 and 43) of the organism used for inoculation tests since 1928, the former has undergone an annual attenuation of virulence, whereas the pathogenicity of the latter has steadily increased in culture on artificial media.

Ryker (T. C.). **Rice disease investigations.**—*Bienn. Rep. La Rice Exp. Sta., 1935–1936*, pp. 13–14, [? 1937].

Cercospora [? *oryzae*: *R.A.M.*, xvi, p. 405] was widespread and severe during the latter part of the 1935–6 season among Early Prolific and Blue Rose rice crops in Louisiana, a high degree of resistance being

shown by Rexoro, Fortuna, and Nira. This character was observed in F_1 and F_2 crosses of Blue Rose × Rexoro to be dominant and to depend on a single genetic factor.

A species of *Pythium* [ibid., xiv, p. 221] caused a root rot and chlorosis of stands growing under adverse soil conditions associated with excessive alkalinity or low fertility. Inoculation experiments, however, showed the fungus to be pathogenic even to plants in a favourable environment.

The common sheath spot disease of rice, the symptoms of which agree with those described by E. C. Tullis as due to *Trichoderma lignorum* [ibid., xiv, p. 331], has been found to be caused by an apparently new strain of *Rhizoctonia* capable of withstanding exceptionally high temperatures. All the *R.* isolates from 22 collections of diseased material in Louisiana and Texas proved to be highly virulent, both when inoculated directly into the leaf sheaths and when placed in the soil round the growing plants. *T. lignorum* was isolated only in a few cases and gave negative results in inoculation tests.

MURRAY (R. K. S.). **Report of Botanist and Mycologist for 1936.**—*Rep. Rubb. Res. Bd, Ceylon, 1936*, pp. 30–41, 1937.

During 1936, *Oidium* leaf disease of *Hevea* rubber [*O. heveae: R.A.M.*, xvi, pp. 61, 202] and secondary leaf fall due to *Phytophthora palmivora* [ibid., xv, p. 50] caused far less damage in Ceylon, except at altitudes of about 2,000 feet, than in any recent year. Sulphur dusting was less beneficial than is generally the case in the Kalutara and Kelani Valley districts, but in the mid-country estates the contrast between some dusted and undusted areas at high elevations was very striking. During wet weather in June and July, *P. palmivora* again caused extensive leaf fall in a dusted area [loc. cit.]; most estates in Kalutara lost between 25 and 50 per cent. of the leaves, and would have lost more if the wet weather had continued. It is clear that the advisability of sulphur dusting in wet, low-lying areas needs careful consideration. The recommendation made in 1906 was to dust lightly in order to obtain only slight control of *O. heveae* and so allow the fungus to attack the highly susceptible flowers while protecting the leaves; but the incidence of powdery mildew was so slight that no evidence as to the effectiveness of this procedure was obtained. It is now recommended that in low-lying areas dusting should be deferred until the young leaves crinkle, subsequent procedure depending on the course of refoliation and the prevailing weather. In demonstrational work in 1936, it was found that an average area of about 200 to 300 acres can be dusted with one machine in charge of a supervisor, given a 7-day interval between the applications. A more ambitious undertaking would probably cost about 10 rupees per acre per annum [loc. cit.]. A considerable demand for dusting by the larger small estates on a contributory basis may be anticipated but the real smallholder is not prepared to contribute anything to the cost of treatment.

SINGH (J.). **Observations on the microflora of the Punjab soils.**—*Curr. Sci.*, v, 11, p. 589, 1937.

In addition to a number of common soil fungi, representing 13 genera,

the writer isolated from Punjab soils [*R.A.M.*, xv, p. 232] [undetermined] species belonging to the following genera not previously reported as occurring in soil, e.g., *Choanephora*, *Fusicoccum*, *Cytospora*, *Striochaete*, *Mapea*, and *Stemmaria*. Species of those of *Aspergillus* predominated in the warmer soils over *Penicillium*, the latter tending to become more prominent during the winter months, but counts of fungi and actinomycetes on acid Coon's agar show no definite seasonal periodicity for these two groups [cf. ibid., xvi, p. 558].

Svinhufvud (V. E.). **Untersuchungen über die bodenmikrobiologischen Unterschiede der Cajander'schen Waldtypen.** [Studies on the soil microbiological differences in the Cajander forest types.]—*Acta for. fenn.*, xliv, 67 pp., 3 graphs, 1937. [Finnish summary.]

In the section of this study dealing with the fungi isolated from five different types of Finnish forest soils the writer enumerates 60 species, among which may be mentioned *Mucor ramannianus*, *M. racemosus* [*R.A.M.*, xvi, p. 558], *M. mucedo*, *M. spinosus* [ibid., xv, p. 823], *M. circinelloides* [ibid., xv, p. 314], *Rhizopus nigricans* [ibid., xvi, p. 558], *Trichoderma koningi*, *T. lignorum*, *Aspergillus* and *Penicillium* spp. (including *A. flavus*, *A. fumigatus*, *A. niger* [ibid., xvi, p. 575], *P. crustaceum*, *P. silvaticum* [ibid., xv, p. 257], and *P. humicola*), *Thamnidium elegans* [loc. cit.], *Briarea elegans*, *Sporotrichum polysporum* and other *S.* spp., *Botrytis fulva*, and *Acrostalagmus albus*. The organisms, especially the Mucorineae, predominated in the superior soil types, and the maximum number of isolations (74) was made in January, the corresponding figures for March and September being 35 and 22, respectively [cf. preceding abstract].

Mitchell (J. E. M.). **Progress report of the Forest Administration in Coorg for 1935–36.**—59 pp., 1936. [Received July, 1937.]

Some items of interest in connexion with spike disease of sandal (*Santalum album*) [*R.A.M.*, xvi, p. 340] occur in this report. Fresh cases of the disturbance were observed in three villages of the Coorg (Mysore) State forests and immediately suppressed. Trees pollarded in the Bambookadu 1918 area were found to be infected, treated with 'Atlas' [an arsenical tree killer: ibid., xiv, p. 539], and uprooted. A total of 1,468 spiked trees were treated with this preparation in the Fraserpet and Somwarpet Ranges; solution 'A', supplied by the Indian Institute of Science, Bangalore, was more effective than 'B'. Spike disease control operations have also been successfully undertaken in an experimental protective area laid down in 1935.

Informe del Profesor Carlos E. Chardon sobre el 'mosaico' de la Caña de Azucar al Señor Ministro de Agricultura y Comercio Doctor Manuel Jose Vargas. [Report of Prof. Carlos E. Chardon on Sugar-Cane mosaic to the Minister of Agriculture and Commerce, Doctor Manuel Jose Vargas.]—*Agricultura, Bogotá*, ix, 6, pp. 108–120 3 figs., 1937.

Details are given of the writer's observations on mosaic in Colombian sugar-cane plantations on a recent visit of inspection in the course of which, in addition to observations on the rapid spread of the disease

and the heavy losses occasioned thereby, he detected the presence of *Aphis maidis* on *Eleusine indica* and pará grass [*Brachiaria mutica*].

[The same number of this periodical contains anonymous popular articles on sugar-cane mosaic (pp. 121–125, 1 col. pl., 2 figs.) and on the introduction of disease-resistant sugar-cane varieties into Colombia with reference, e.g., to gummosis (*Bacterium vasculorum*) [ibid., xv, p. 317] (pp. 126–135, 1 fig.), and cites an Act of 30th December, 1936, providing for the subsidization by the Government of a campaign for the control of mosaic.]

VIDAL (L. F.). **El 'mosaico' de la Caña de Azucar.** [Sugar-cane mosaic.] —*Rev. Agric., S. Domingo*, xxviii, 89, pp. 55–58; 90, pp. 133–135; 91, pp. 189–195, 1937.

This is a survey of the available information on the history, etiology, symptomatology, mode of propagation, effects on yield, and control of sugar-cane mosaic by field sanitation and the use of resistant varieties in the Dominican Republic [*R.A.M.*, iii, p. 427; vii, p. 21; xi, p. 74].

HINO (I.). **Identification du champignon japonais Reissi ou Mannen-Také avec le Ganoderma lucidum.** [Identification of the Japanese fungus 'Reissi' or 'Mannen-Také' with *Ganoderma lucidum*.]—*Bot. & Zool.*, v, 5, pp. 917–924, 4 figs., 1937. [French summary.]

The author regards *Ganoderma japonicum*, known under the Japanese name of Reissi (sometimes used for other species as well), as merely a local form synonymous with *G. lucidum* [*R.A.M.*, xv, p. 684].

PETRAK (F.). **Verzeichnis der neuen Arten, Varietäten, Formen, Namen und wichtigsten Synonyme der Pilze 1922–1928.** [List of new species, varieties, forms, names, and the most important synonyms of the fungi 1922–1928.]—*Just's Jber.*, lvi (*1928*), Abt. II, 2, pp. 291–480; 3, pp. 481–697, 1937.

This is a list of the new genera, species, varieties, forms and synonyms of fungi recorded in the years 1922 to 1928. The species are arranged alphabetically with full citations of place of publication, the substratum, and the country of origin, new genera being indicated with thick type.

HOLMES (F. O.). **Inheritance of resistance to Tobacco-mosaic disease in the Pepper.**—*Phytopathology*, xxvii, 5, pp. 637–642, 1937.

All varieties of garden pepper (*Capsicum frutescens*) tested proved susceptible to infection by the author's distorting strain of tobacco mosaic (tobacco distorting strain virus 1) [*R.A.M.*, xvi, pp. 129, 414, 417]. In addition to the two types of response previously described, viz., systemic chlorosis and localized necrosis followed by abscission and recovery [ibid., xiv, p. 126], the virus induced two others, namely, delayed necrosis, accompanied by leaf abscission frequently allowing of escape from systemic infection, and systemic necrosis with stem streak and eventual death in all plants. These four reactions were shown by hybridization experiments to be controlled by the three genes L, l^i and l, forming an allelic series in which the first-named (localization of tobacco

mosaic virus) is completely dominant over the other two, representing, respectively, imperfect localization and mottling; l^i is partially dominant over *l*. Infected plants of genetic constitution *ll* develop systemic necrosis; l^il^i delayed necrosis with leaf abscission, frequent recovery, and sparse occurrence of secondary lesions; l^il systemic necrosis in all plants; and *LL*, *Ll*, and Ll^i localized necrosis with subsequent recovery.

The commonest genetic constitution among the commercial large-fruited, non-pungent peppers is the homozygous recessive *ll* represented by the popular California Wonder, World Beater, and Ruby King, field infection of which results in yellowish primary lesions, early foliar branching, temporary retardation of growth, eventual mottling, and a heavy reduction of yield. The l^il^i constitution, typical of the Long Red Cayenne and Sunnybrook group, sustains relatively slight damage. Work is in progress on the development of large-fruited strains of the *LL* constitution.

Кокін (A. J.). Физиологическое изучение вредоносности обыкновенной мозаики Табака Дюбек Никитский № **44.** [Physiological study of the injuriousness of common Tobacco mosaic to the Dubec Nikitsky No. 44 variety.]—*Pl. Prot., Leningr., 1937*, 12, pp. 95–112, 1937. [English summary.]

A tabulated account is given of controlled hothouse experiments in Leningrad to test the effect on the tobacco plant (Dubec Nikitsky No. 44 variety) of artificial inoculation at different phases of growth (on the 6th and 7th leaves in series 1 and 12th leaf in series 2) with Johnson's tobacco virus 1. The results showed that transpiration was reduced in the diseased plants, in which it ranged from 47·4 to 91·2 and from 77·3 to 93·2 per cent. of that of healthy plants in series 1 and 2, respectively. The osmotic pressure of the juice of infected leaves was somewhat lower than that of sound foliage. In plants with marked mosaic symptoms assimilation is diminished to 57·4 or even to 42·6 per cent. of the normal rate. The soluble carbohydrate content of mosaic tobacco leaves is lower than that of healthy ones. On the other hand, the infected leaves have higher protein nitrogen, proteid, and nicotine contents than healthy ones [cf. *R.A.M.*, xvi, p. 418], the excess of the last-named amounting to 35 per cent. over sound material in series 1.

The reduction in foliar surface due to mosaic amounted to between 59·6 and 85 per cent. in series 1 and to between 64·5 and 88 per cent. in series 2, the corresponding figures for yield reduction being 34·1 and 37·8 per cent., respectively. The root system is also reduced to two-thirds of the normal in plants of series 1.

Wyckoff (R. W. G.). **Méthode pour la préparation des protéines par l'ultracentrifugation.** [A method for the preparation of proteins by ultracentrifugation.]—*C.R. Soc. Biol., Paris*, cxxv, 14, pp. 3–5, 1937.

A brief description is given of the construction and application of the ultracentrifuge used by the writer and his colleagues in the study of the tobacco mosaic virus, a note on which has already appeared from another source [*R.A.M.*, xvi, p. 638].

Wyckoff (R. W. G.). **La préparation des virus-protéines par l'ultra-centrifugation.** [The preparation of virus proteins by ultracentrifugation.]—*C.R. Soc. Biol., Paris*, cxxv, 14, pp. 5–7, 1937.

Certain recent developments in the analytical study of the ultracentrifuged tobacco mosaic virus protein are briefly traced [see preceding abstract], and some observations are made on the extension of the investigations to an animal virus (infectious papilloma of the rabbit), and on the general interest of the problems under consideration.

McIntosh (J.) & Selbie (F. R.). **The measurement of the size of viruses by high-speed centrifugalization.**—*Brit. J. exp. Path.*, xviii, 2, pp. 162–174, 1 pl., 2 figs., 3 diags., 3 graphs, 1937.

Details are given of the construction of an air-driven centrifuge devised at the Bland-Sutton Institute of Pathology, Middlesex Hospital, London, W. 1, for the sedimentation of viruses and bacteria [cf. preceding abstracts]; it is capable of speeds of over 60,000 revolutions per minute and runs smoothly at a constant temperature. The sedimentation rates of various bodies and viruses can be expressed graphically and show a 'sedimentation angle', to the square root of the tangent of which the size of the particles [*R.A.M.*, xv, p. 672] has been shown to be proportional. From the data obtained a simplified formula, essentially similar to that of Stokes, has been established for the determination of the actual size of the particles calculable by means of this apparatus.

Park (M.) & Fernando (M.). **Some studies on Tobacco diseases in Ceylon. II. Field spraying against frog-eye (Cercospora nicotianae E. & E.).**—*Trop. Agriculturist*, lxxxviii, 5, pp. 266–282, 1937.

Subsequent examination of transplanted tobacco sprayed with colloidal copper in the nursery showed that only the first leaves, which were removed at the first priming, were protected against frog eye (*Cercospora nicotianae*) [*R.A.M.*, xvi, p. 566], and control did not extend to later infection.

In a preliminary test, with the object of finding if effective and economic control could be obtained by a single spraying of plants in the field, plants treated in the nursery as previously described [loc. cit.], with suitable controls, were sprayed with a mixture composed of bouisol 1 oz., agral No. 2 $\frac{1}{16}$ oz., per gall. of water, on the 7th, 20th, and 26th January, 1937, 55, 74, and 99 days, respectively, after transplanting. The main crop was harvested 102 days after transplanting, and the results [which are shown in tabular form with full statistical data], are stated in terms of degree of freedom of the leaf from frog eye immediately before harvesting, and from frog eye and barn spot after curing.

The first and third sprayings were apparently too early and too late, respectively, to have any effect, but the second, applied at about the time of topping, gave excellent results, showing 486 'clean' (0 to 2 lesions) leaves out of a total of 760, as against 68/801 in the control plots, and 44/891 and 56/818 in the first and third sprayed plots, respectively; while in the cured leaf the second spraying gave 120 leaves with 0–25 lesions, 12 with 26–50, 5 with 51–100, and 3 with over 100, as against 1, 4, 11, 60 in the control, 0, 5, 6, 7 in the first spraying, and 5, 15, 19, 52 in the third spraying, respectively.

Spraying appeared to have no adverse effect, as judged by the cured leaf, and no scorching occurred. It was observed that heavy infection took place during dry weather, and it is concluded that high humidity is not necessary for infection.

Taylor (G. G.) & Chamberlain (E. E.). **Spotted-wilt on Tobacco.**—*N.Z. J. Agric.*, liv, 5, pp. 278–283, 4 figs., 1937.

Spotted wilt, reported in 1936 as known for some years on tomatoes in New Zealand [*R.A.M.*, xv, p. 324], has now been recorded on tobacco [ibid., xiii, p. 190; xvi, p. 134]. For the past four seasons it has been present in Auckland and the Bay of Plenty districts, where it has been known as 'black wilt', and in the latter district caused a loss of 25 per cent. of the crop in the 1932–3 season. In 1934–5 and 1935–6 it appeared in experimental plantings at Palmerston North. Diseased plants rarely yield any curable leaves, and become infected too late in the season for replacement.

Cross-inoculations from and to tomato and tobacco by the leaf-rubbing method produced identical symptoms in each case, and it is concluded that the same virus is responsible for both diseases. *Thrips tabaci*, identified as the vector elsewhere [ibid., xiv, pp. 404, 610, 763], commonly occurs in New Zealand, where preliminary experiments have shown that it is responsible for the transmission of the disease. It is also probable that some infection is occasioned by handling. The virus probably overwinters in annuals which grow through the winter or perennials, such as dahlias, or potatoes.

Recommendations for control comprise regular examination and roguing (applied also to neighbouring tomatoes), the diseased plants being burned or buried; washing the hands after handling diseased plants; and ploughing out volunteers.

Wilson (J. D.) & Runnels (H. A.). **The effect of various spray materials on Tomato transplants.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 185, pp. 58–65, 3 figs., 1937.

Continuing their studies on the effect of various sprays on tomato plants [*R.A.M.*, xvi, p. 420], the authors describe further experiments in which tomatoes of the usual size for transplanting were sprayed shortly before removal from the seedling flat, and then at 1- to 7-day intervals after.

Spray applications of Bordeaux mixture (4–4–50) were highly injurious, causing the death of many plants transplanted immediately after treatment. On the other hand, the plants treated with Volck concentrate (1 in 100) showed little injury, and the addition of this material to the Bordeaux mixture greatly reduced the damage caused by the latter. Most of the materials capable of increasing transpiration caused injury when the sprayed plants were removed as soon as the leaves were dry, though copper oxychloride and cuprous oxide caused only negligible injury when spraying was delayed until 48 hours after removal from the flat. Bordeaux mixture produced little ill effect when 5 days elapsed between spraying and transplanting to the field.

It is concluded that Bordeaux mixture should not be used on tomato plants in the seed-bed less than 5 days before transplanting, or on newly

transplanted tomatoes, especially if the soil is low in moisture. An interval of 2 or 3 days suffices if copper oxychloride or cuprous oxide is used.

KOTTE (W.). **Die Farn- oder Fadenblättrigkeit der Tomate.** [Fern or thread leaf of the Tomato.]—*Z. PflKrankh.*, xlvii, 2, pp. 65–72, 8 figs., 1937.

Outdoor tomatoes of the Augusta, Gross-Umstadter, and Stonor's M.P. varieties were observed in July, 1936, to be suffering from fern leaf [*R.A.M.*, xvi, p. 639] in several Baden nurseries, where fruit production was entirely inhibited from the onset of the disease [the symptoms of which are briefly described in the light of contemporary researches and control measures indicated]. During the period covered by the local inspections the weather was abnormally cold, wet, and dull, and these conditions probably occasioned the development of the disease which had hitherto passed unnoticed in the district. The introduction of the virus on Stonor's M.P. seed, imported from England three years earlier, is a possibility.

VERRALL (A. F.). **Variation in Fomes igniarius (L.) Gill.**—*Tech. Bull. Minn. agric. Exp. Sta.* 117, 41 pp., 12 figs., 2 graphs, 1937.

It is evident from a perusal of the relevant literature that the taxonomic separation of the variety *nigricans* from the typical *Fomes igniarius* [*R.A.M.*, xii, p. 543; xvi, p. 137] rests on an obscure and uncertain basis. From the morphological and cultural characters of collections of *F. igniarius* made in eight localities in Minnesota and one in Colorado from 1931 to 1933, three groups appear to be distinguishable, one limited to aspen (*Populus tremuloides* and *P. grandidentata*) [ibid., xiii, p. 604], a second to birch (mainly *Betula papyrifera* but also occurring on *B. lutea*) [loc. cit.], and a third associated with miscellaneous hosts, including *B. lutea*, *Ostrya virginiana*, *Carya cordiformis*, and *Juglans cinerea*. The sporophores of group (1) are relatively small, with the pore surface often at a wide angle from the horizontal; those of (2) larger, more applanate, with a fairly smooth upper surface; while the fruit bodies of (3) resemble those of (1) except in their more ungulate shape and rimose tops. With few exceptions, the pore diameters of (1) and (2) are similar (100·8 and 102·9 μ, respectively), that of (3) being much larger (149·2 μ), the setae of (1) are longer (15·8 μ) than those of the other two groups (13·4 and 13·1 μ), and the hyphae of (1) are larger (4·45 μ in diameter) than those of (2) and (3), measuring 3·19 and 3·18 μ, respectively.

In malt agar cultures the aspen group (1) is characterized by a distinctive methyl salicylate odour and comparatively slow growth, (2) develops fairly rapidly, and (3) commonly produces thick, dense tufts at the centre of ageing cultures. There are further innumerable variations involving antagonistic reactions between all isolates originating from different mycelia. The optimum temperature (27·5° C.) was found to be about the same for all three groups, this figure being considerably lower than the estimate (30°) of previous workers; the minimum and maximum are below 2° to 4° and about 40°, respectively.

The results of decay tests showed that only one of the aspen isolates

(A 13) differed appreciably from the rest in its capacity to disintegrate aspen wood, which was very slight in comparison with the other strains. On *B. papyrifera* and red gum (*Liquidambar styraciflua*), however, the disparities were more marked, the aspen isolates being in general slow, the white birch fast, and those from miscellaneous hosts intermediate in their decomposition rates.

F. igniarius appears to be heterothallic, four, two, and three sex groups being comprised within the white birch, *O. virginiana*, and aspen haploid cultures, respectively. Haploid cultures are slower in growth and in their action on wood than the dicaryotic tissue cultures of the parent fruiting bodies. No sexual fusions between the three groups were observed.

The growth of the aspen isolates on malt agar was totally inhibited by concentrations of 0·08 to 0·11 per cent. zinc chloride, the corresponding figures for those from white birch and miscellaneous trees being 0·14 or slightly above and 0·14 to 0·21 per cent., respectively.

Macdonald (J. A.). **A study of Polyporus betulinus (Bull.) Fries.**—*Ann. appl. Biol.*, xxiv, 2, pp. 289–310, 2 pl., 22 figs., 1937.

In this study on *Polyporus betulinus* [*R.A.M.*, xiii, p. 604], prevalent on birch in Scotland, the author was unable to secure infections in his inoculation experiments but nevertheless concludes, from field observations, that the organism is a wound parasite. The type of breakdown caused by the fungus is a red-brown cubical rot affecting both the sap- and heartwood. The fungus secretes at least eight ferments including some capable of attacking lignin. Cultural criteria, on the lines of [Clara W.] Fritz [*R.A.M.*, iii, p. 490], are described which place the fungus in the same group as *Poria subacida*. Black lines, representing the wall of a resting body, are formed in culture, together with small, light brown, roughly spherical sclerotium-like bodies termed bulbils. Details are given of the fertile sporophore and the nuclear phenomena in the basidium. The fungus is heterothallic, and monosporous mycelia bear no clamp-connexions.

Hepting (G. H.) & Hedgcock (G. G.). **Decay in merchantable Oak, Yellow Poplar, and Basswood in the Appalachian region.**—*Tech. Bull. U.S. Dep. Agric.* 570, 30 pp., 6 graphs, 1 map, 1937.

An investigation into the decay situation in standing hardwood trees of merchantable size and condition in the Appalachian region of the United States showed that the commonest fungi causing decay on oak (*Quercus alba, Q. montana, Q. stellata, Q. borealis, Q. borealis maxima, Q. velutina, Q. coccinea*) were *Polyporus sulphureus* [*R.A.M.*, xvi, p. 358], *P. sprague*i [ibid., xi, p. 275], *Hydnum erinaceus* [ibid., xv, p. 470], and *Armillaria mellea* [ibid., xvi, p. 564]. On yellow poplar (or tulip tree: *Liriodendron tulipifera*) decay was associated with *Pleurotus ostreatus* [loc. cit.], *H. erinaceus*, *A. mellea*, and *Hypholoma* sp., and on basswood (*Tilia* spp.) with *Pholiota adiposa* [ibid., xv, p. 72; xvi, p. 292].

Of the total cull volume 77, 20, and 3 per cent., respectively, was due to butt defect, top rot, and miscellaneous defects, decay causing more defect than any other factor. Cull per cent. increased with tree diameter and tree age. The height of butt rot increased with tree age up to a

certain point and a curvilinear relation was established between the average diameter of rot and the length of the rot column, though there was considerable individual variation.

Of the trees examined 47·1, 0·6, and 1·5 per cent., respectively, had wounds caused by fire, lightning, and other factors. Only 6 per cent. of the trees without basal wounds showed butt rot, with 1·5 per cent. cull, while of those with basal wounds 67 per cent. showed butt rot, with 15·5 per cent. cull. Butt-cull volume increased with width of basal wound and with tree age at time of wounding.

HIRANE (S.). **Studies on the parasitism of the rust of Acacia confusa Merrill, Maravalia hyalospora (Saw.) Diet. I. Reaction to the rust of maturity of phyllodes.**—*Trans. nat. Hist. Soc. Formosa*, xxvii, pp. 69–89, 3 figs., 1937. [Japanese, with English summary.]

The results of inoculation tests under controlled conditions with *Maravalia hyalospora* [*R.A.M.*, xiv, p. 611] on potted *Acacia confusa* plants indicated that temperature is a decisive factor in the reaction of the host to infection by the rust, which assumes a very severe form in the spring and autumn at temperature ranges of 17° to 24° and 20° to 26·5° C., respectively, while in the winter (13° to 18·5°) the damage is milder, and in the summer (23·5° to 32°) negligible. The minimum, optimum, and maximum temperatures for uredo- and teleutospore germination were found to lie between 9° and 13°, 22° and 25°, and 31° and 34°, respectively. Teleutospore infection is generally restricted to the very young phyllodes, viz., the first and second from the tops of the young twigs and occasionally the young (apical) portion of the third phyllode, being barely perceptible on the older ones (third to sixth), whereas in the case of the uredospores these relations are reversed. The uredospore germ-tubes usually produce amoeba-like appressoria in the susceptible phyllode areas: these organs are rudimentary or absent on the resistant and immune portions, suggesting the secretion by the young phyllode tissues of some substance stimulating appressorial formation.

COLE (J. R.). **Bunch disease of Pecans.**—*Phytopathology*, xxvii, 5, pp. 604–612, 4 figs., 1937.

In this expanded account of the bunch disease of pecans (*Hicoria* [*Carya*] *pecan*), a preliminary note on which has already appeared [*R.A.M.*, xvi, p. 506], the writer points out the close resemblance of certain symptoms of the new disorder to rosette of the same host [ibid., xvi, p. 73] and its similarity in some characters with little leaf of pecans [ibid., xiv, p. 768; cf. above, p. 682], phony peach and peach yellows [ibid., xvi, pp. 329, 621], and witches' broom of black locust (*Robinia pseud-acacia*) [ibid., xiv, p. 462]. Water hickory (*H.* [*C.*] *aquatica*) is also liable to the trouble.

GÄUMANN (E.) & JAAG (O.). **Über eine neue Erkrankung der Tanne (Abies alba Hill.) und der Fichte (Picea excelsa [Lam.] Link.).** [On a new disease of the Fir (*Abies alba* Mill.) and of the Spruce (*Picea excelsa* [Lam.] Link.).]—*Phytopath. Z.*, x, 1, pp. 1–16, 18 figs., 1 graph, 1937.

Firs (*Abies alba*) and spruces (*Picea excelsa*) planted on heavy diluvial

macadam and clay soil in a reafforestation area of the Emmental, Switzerland, 900 to 1,100 m. above sea-level, in the '70's of last century have sustained severe damage during the past decade from a disease characterized by ill-defined, flat, striate cortical depression, mostly extending from the butt upwards to the crown but sometimes confined to the upper part of the tree, and occasionally accompanied by an outflow of resin. Within a few years the sunken areas, numbering up to about two dozen, eat deeply into the stem, the hollowed cortex becoming desiccated and tending to rupture; eventually the individual fissures unite, the entire trunk bursts open, and at this stage the trees resemble those suffering from old, neglected frost cracks. The upward growth of the affected trees is arrested and the leader-shoot dies, so that a 'stork's nest' aspect is assumed by the crown.

The causal organism of the disease, *Pleurotus mitis*, is described and its effects on the internal tissues of the hosts discussed. The symptoms generally resemble those of the red rot associated with the honey fungus [*Armillaria mellea*] and involve the cambium and xylem, where its striate development corresponds to the above-mentioned depressions on the cortex. *P. mitis* is a virulent pathogen, arresting the incremental growth of the trees and causing widespread disintegration of the tissues.

The minimum, optimum, and maximum temperatures for the development of the fungus in malt agar cultures were found to be under 3°, 15° to 24°, and 27° to 30° C., respectively.

Positive results were given by inoculation experiments *in situ* with the mycelium of *P. mitis* on eight 30- to 35-year-old firs, six spruces of a similar age, and two 15-year-old white pines (*Pinus strobus*), whereas *P. cembra* and *Pseudotsuga douglasii* [*P. taxifolia*] failed to contract the disease. The symptoms were most intense on *A. alba*, the woody tissues of which surrounding the site of inoculation were found, after a period of two years and four to five months, to be completely destroyed by a red or wet rot.

[An abridged account of these investigations appears in *Schweiz Z. Forstw.*, lxxxviii, 6, pp. 145–151, 2 pl., 1937.]

HANSEN (H. N.) & SMITH (R. E.). **A bacterial gall disease of Douglas fir, Pseudotsuga taxifolia.**—*Hilgardia*, x, 14, pp. 569–577, 4 figs., 1937.

In this full account of their studies on the bacterial gall disease of Douglas fir (*Pseudotsuga taxifolia*) [*R.A.M.*, xiii, p. 1] the authors state that the disease is commonly observed in marginal localities for the growth of the Douglas fir in California where the tree is practically worthless for timber production but has economic importance as an ornamental. In the course of inoculation experiments it became evident that the pathogen can remain in the host for nearly a year before galls begin to appear, and that gall formation is limited to the active period of the host twig from late March to July; furthermore the organism appears to find it relatively difficult to establish itself during late summer. The fact that actual contact between the pathogen and the xylem of the host is apparently essential to gall formation indicates transmission of the disease by insects, among which *Chermes cooleyi* is probably the vector, since it was observed to feed on the galls and three

galls were definitely traced to wounds produced by this insect. Evidence is adduced that the pathogen is highly specific to the Douglas fir. On cultural, morphological, and physiological bases the organism is considered to be distinct from known species and is accordingly named *Bacterium pseudotsugae*. It is a non-motile rod, with rounded ends, non-sporing, Gram-negative, non-acid-fast, liquefies gelatine, produces slight hydrogen sulphide, reduces nitrates, forms no acid in milk, produces no ammonia, no acid or gas in lactose, sucrose, or glycerine, but produces acid without gas in glucose, levulose, galactose, and maltose; starch is not hydrolysed.

STEINER (H.). **Adelopus balsamicola (Peck) Theiss. f. Douglasii als Erreger einer Schütteerkrankung der Douglastanne.** [*Adelopus balsamicola* (Peck) Theiss. f. *douglasii* as the agent of a needle-fall disease of the Douglas Fir.]—*Z. PflKrankh.*, xlvii, 3, pp. 164–186, 13 figs., 1 map, 1937.

Following an introductory sketch of the Douglas fir (*Pseudotsuga taxifolia* and vars.) in its original home (North America) and of its silvicultural possibilities and liability to parasitic diseases in Europe, the author describes the geographical distribution of the *Adelopus* needle fall disease (*A. balsamicola*) [*R.A.M.*, xvi, p. 507], with special reference to its occurrence in Austria, where it was first observed in the Feldkirch district of Vorarlberg at an altitude of 500 m. above sea-level, having presumably been introduced either with seedlings from Germany or by means of spores from Switzerland.

Comparative microscopic studies of Austrian material of the fungus on *P. taxifolia* and *Abies balsamea* revealed no differences between the asci and ascospores on the two hosts, but the perithecia of the strain on the former were more or less rounded, 55 to 70 μ in diameter and 46 to 58 μ in height, the basal portion tapering down into a stalk 8·5 to 16 μ long, filling the substomatal chamber. These peculiarities, due to anatomical features of the host, serve to distinguish the strain of *Adelopus balsamicola* on *P. taxifolia* from the recognized form on *Abies balsamea*, with applanate-globose to elliptical perithecia, furnished with a stalk 30 to 43 μ in length, arising from a definite basal plate and the former is accordingly named *Adelopus balsamicola* f. *douglasii* n. f., with a Latin diagnosis.

[A condensed account of these researches appears in *Silva*, xxv, 25, pp. 189–191, 1937.]

MACRAE (RUTH). **Interfertility phenomena of the American and European forms of Panus stypticus (Bull.) Fries.**—*Nature, Lond.*, cxxxix, p. 674, 1937.

Although morphologically alike, American and European forms of *Panus stipticus* [*R.A.M.*, ix, p. 216; xi, p. 497; xiv, p. 270] differ in that the former is luminous and the latter non-luminous. By pairing monosporous cultures both forms were found to be heterothallic, tetrapolar, and completely interfertile. In 64 pairings of the two forms the F_1 diploid mycelium produced has been found to be luminous, showing that luminosity is dominant.

PEARSON (O. H.). **The effect of various dusts upon the rate of seeding of various vegetable seeds.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 559–561, 1937.

When spinach, kohlrabi, Chinese cabbage [*Brassica pekinensis*], radish, lettuce, carrot, beet, tomato, parsnip, celery, and pea seed dusted with cuprous oxide or zinc oxide was planted by a gravity flow equipment machine, the seeding rate was increased or decreased by up to 23 per cent., the amount and direction of the difference apparently being correlated with the smoothness or roughness of the seed surface and its density. The seeding rate was retarded for smooth-coated seeds and accelerated for rough-coated ones. The addition of graphite [*R.A.M.*, xv, p. 552] to the dusts reduced the seeding rate of carrot and lettuce seed, but increased that of the smooth-coated types and wrinkled peas, though this effect cannot be as closely correlated with the seed-coat type as when dust alone is used. Growers are cautioned to adjust planting machines to a normal rate of seeding.

EZERSKAYA (Mme E. I.). Хлорпикрин как дезинфектор почвы в парниках. [Chloropicrin as soil disinfectant in hot frames.]—*Pl. Prot., Leningr.*, *1937*, 12, pp. 113–120, 1937.

Details are given of experiments in 1935 and 1936 in two Ukrainian stations, the results of which confirmed those described by Masslovski [*R.A.M.*, xvi, p. 293] concerning the efficacy of chloropicrin in the control of black leg (*Moniliopsis aderholdi*, in association with *Fusarium* and *Botrytis* spp.) of cabbage seedlings in hot frames. Watering the frames with 40 to 80 gm. chloropicrin reduced the incidence of the disease from 10 to 35 per cent. in the control frames to 0·3 to 1 per cent. in the treated frames.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xi, 5, pp. 90, 96–97, 1937.

COLOMBIA. A Decree of 16th December, 1936, prohibits the importation of sugar-cane seed from foreign countries with a view to the exclusion from the Republic of diseases [see above, p. 711] and pests, exceptions being made, however, in favour of the two Porto Rican Experiment Stations at Mayaguez and Río Piedras and the Bureau of Plant Industry, United States Department of Agriculture, consignments from which must be accompanied by official health certificates.

LUXEMBURG (Grand Duchy of). Under the terms of a Decree of 18th July, 1936, potato tubers and tomato and eggplant fruits imported into Luxemburg must be accompanied by duly authenticated certificates vouching for the absence from the place of origin and from a surrounding radius exceeding 5 km. of wart disease (*Synchytrium endobioticum*) [*R.A.M.*, iii, p. 559; xv, p. 752].

UNION ISLANDS. In virtue of the Union Islands Plant Protection Ordinance of 18th November, 1936 (effective as from 1st December), all plants or parts thereof, fruits, or soil are debarred from entry into the Union (Gilbert and Ellice) Islands except by a written permit of an Inspector or District Officer.